

# TENEBRIONIDAE BEETLES OF THE NEVADA TEST SITE<sup>1</sup>

by

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and

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## INTRODUCTION

In August 1959 Brigham Young University initiated an ecological study of the animals at the Nevada Test Site. As part of that study, emphasis was given to the ground-dwelling arthropods. One of the largest resulting collections was beetles in the family Tenebrionidae. These are herein described, and notes on their relative abundance, seasonal occurrence, and plant community relationships at the test site are included. The results reported here deal with those collected between August 1959 and July 1963.

The Nevada Test Site is situated in southern Nye County adjacent to northwestern Clark County and southwestern Lincoln County, about 70 miles northwest of Las Vegas, Nevada (refer to Allred, Beck, and Jorgensen, 1963a). It is approximately 40 miles long and 35 miles wide. Beetles were taken from three major areas of the test site—Frenchman Flat, Yucca Flat, and Rainier Mesa. The geography and ecology of the area were discussed in detail by Allred, Beck, and Jorgensen (1963a) in *Biotic Communities of the Nevada Test Site*. Their plant community designations of Larrea-Franseria, Grayia-Lycium, Salsola, Coleogyne, Atriplex-Kochia, Pinyon-Juniper and Mixed have been followed in this paper with slight modification. In Frenchman Flat *Lycium pallidum* occurs as a narrow, relatively pure stand which extends from the playa through the Larrea-Franseria. Inasmuch as the beetle fauna differed so much between this *Lycium* area and other areas in the Larrea-Franseria community where *Lycium* was much less abundant, it is herein considered as a separate community.

In Yucca Flat the vegetation in large areas in the Grayia-Lycium community has been disturbed and partially destroyed by nuclear weapons testing. Here also the beetle fauna differed.

These areas are referred to herein as disturbed Grayia-Lycium in contrast to the Grayia-Lycium (undisturbed).

Beetles were collected at regular intervals in sunken can traps described and illustrated by Allred, *et al.* (1963a). Others were collected intermittently by hand from plants, small mammal burrows, under rocks, debris, bark, etc., and by use of an ultraviolet light.

Can traps usually were placed in two parallel lines 825 feet apart, each line with six cans spaced at 150-foot intervals. In the Mixed community an additional line of cans spaced at irregular intervals was used, and in the Pinyon-Juniper the lines of cans were 75 feet apart. In the disturbed Grayia-Lycium, however, four lines of traps radiated from ground zero (the point where a nuclear detonation took place). Each of these lines extended through an area completely denuded of native plants (but now invaded by *Salsola kali*), through adjacent zones of physically damaged plants, and terminated in areas of undisturbed vegetation. Each line consisted of thirty cans placed 265 feet apart.

Regular collections were made in each community for at least a year's period, except in the Pinyon-Juniper between November and March when snow cover prevented access to the study area. More incidental collections were made in some communities than in others. Therefore, for purposes of relative population comparisons, the total number of specimens collected in each community was adjusted according to the number of collection attempts.

The tenebrionids were preserved in 70% ethyl alcohol until pinned. Identified specimens have been deposited in the collections of Brigham Young University and other institutions and museums as indicated by Allred, *et al.* (1963b).

<sup>1</sup>Report No. C00-1355-6. Field work completed under AEC Contract AT(11-1)786.

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## ACKNOWLEDGMENT

Acknowledgment is made of United States Atomic Energy Commission contracts AT(11-1)-786 and AT(11-1)1355 with Brigham Young University which provided financial support for part of this study. We are grateful to Drs. Donald M. Allred and D Elden Beck, principal and associate investigators of the Nevada Test Site ecology projects, for permission to utilize their data and for their suggestions. Appreciation is expressed to Dr. Harold J. Grant, director of entomology, Academy of Natural Sciences of Philadelphia; Dr. T. J. Spilman, Department of

Entomology, U. S. National Museum, and Mr. Hugh B. Leech, curator of entomology, California Academy of Sciences, for many courtesies and loans of specimens to the senior author while at these respective institutions. We wish to thank Mr. Douglas Hill of the Brigham Young University English Department, our artist, for the care he has taken in making the drawings contained in this paper; and the personnel associated with the Brigham Young University ecology project at the Nevada Test Site and Provo campus laboratory for the collection and preparation of specimens.

## ACCOUNTS OF THE SPECIES

The family Tenebrionidae in the United States is large and varied, with over 1,440 species and subspecies. The keys and literature to the family are scattered through many books and journals, and the taxonomic references to this family are voluminous. One of the early workers was John L. LeConte, who described many species (1851, 1858). The great morphologist, Lacordair, published a section on Tenebrionidae in his *Histoire Naturelle des Insecta* (1859). George H. Horn (1870) monographed the family and published additional treatises in 1874, 1878, and 1891. Thomas L. Casey was one of the prolific workers on this family. He revised the subfamilies Tentyriinae, Coniantinae, and the tribe Asidini (Casey 1907, 1908, 1912) and named many new genera and species. In 1909 Frank E. Blaisdell began a long series of publications on the tribe Eleodini. From his works came many of the subspecific names used in this study. As far as can be determined, very little has been published on the ecology of the beetles of the family Tenebrionidae, although the taxonomic papers of Horn (1870) and LaRivers (1942, 1947, 1948) include notes on habit and seasonal occurrence.

In the four years this study was in progress at the Nevada Test Site, 14,650 specimens representing 31 genera and 46 species and subspecies were collected. These are presented in the following check-list arranged by subfamily, tribe and genus. The number preceding the name indicates its rank in frequency of abundance at the test site. The numbers and letters following each name refer to the subfamily

(1-1), tribe 1(1-1), genus 1(1-1)A and species 1(1-1)A-1. If the description of each category along with this code is followed, there should be very little difficulty in making a determination of a species.

## Subfamily TENTYRIINAE (1-1)

## Tribe EURYMETOPINI 1(1-1)

- 9 *Metoponium convexicolle* LeConte 1(1-1)A-1  
24 *Hyloecrinus laborans* Casey 1(1-1)B-2  
33 *Steriphanus lubricans* Casey 1(1-1)C-3

## Tribe AUCHMOBINI 2(1-1)

- 21 *Auchmobius subborcus* Blaisdell 2(1-1)A-4

## Tribe TRIMYTINI 3(1-1)

- 27 *Chilometopon abnorme* (Horn) 3(1-1)A-5

## Tribe EPITRAGINI 4(1-1)

- 29 *Metopoloba bifossiceps* Casey 4(1-1)A-6

## Tribe TRIOROPHINI 5(1-1)

- 6 *Triorophus laevis politus* Casey 5(1-1)A-7

## Tribe EDROTINI 6(1-1)

- 3 *Edrotes orbus* Casey 6(1-1)A-8

## Tribe ARAEOSCHIIZINI 7(1-1)

- 2 *Araeoschizus sulcicollis* Horn 7(1-1)A-9

## Tribe ANEPSINI 8(1-1)

- 22 *Ancpsius briancus* Casey 8(1-1)A-10

## Tribe CRYPTOGLOSSINI 9(1-1)

- 16 *Cryptoglossa verrucosa* LeConte 9(1-1)A-11  
5 *Centrioptera muricata* LeConte 9(1-1)B-12

## Subfamily ASIDINAE (1-2)

## Tribe ASIDINI 1(1-2)

- 11 *Pelecyphorus pantex* Casey 1(1-2)A-13  
 24 *P. semilaevis* (Horn) 1(1-2)A-14  
 19 *Euschides luctatus* (Horn) 1(1-2)B-15  
 17 *Trichiasida acerba* (Horn) 1(1-2)C-16

## Tribe CRANIOTINI 2(1-2)

- 35 *Craniotus blaisdelli* Tamer 2(1-2)A-17

## Subfamily ELEODINAE (1-3)

## Tribe ELEODINI 1(1-3)

- 14 *Trogloderus costatus nevadus* LaRivers  
 1(1-3)A-18  
 26 *Embaphion elongatum* Horn 1(1-3)B-19  
 10 *Eleodes carbonaria immunis* LeConte  
 1(1-3)C-20  
 12 *E. obscura sulcipennis* Mannerheim  
 1(1-3)C-21  
 8 *E. grancollis valida* Boheman 1(1-2) C-22  
 4 *E. hispilabris sculptilis* Blaisdell 1(1-3)C-23  
 31 *E. longipilosa* Horn 1(1-3) C-24  
 1 *E. armata* LeConte 1(1-3)C-25  
 25 *E. armata pumila* Blaisdell 1(1-3)C-26  
 34 *E. nigrina* LeConte 1(1-3)C-27  
 32 *E. dissimilis nevadensis* Blaisdell 1(1-3)C-28  
 31 *E. longicollis* LeConte 1(1-3)C-29  
 28 *E. tenebrosa* Horn 1(1-3) C-30  
 30 *E. brunnipes brevisetosa* Blaisdell 1(1-3)C-31  
 25 *E. extricata frigida* LaRivers 1(1-3)C-32

## Subfamily CONIONTINAE (1-4)

## Tribe CONIONTINI 1(1-4)

- 34 *Sphaeriontis dilatata* (LeConte) 1(1-4)A-33  
 20 *Eusattus dubius* LeConte 1(1-4)B-34  
 13 *E. agnatus* Casey 1(1-4)B-35  
 24 *Coniontis nevadensis carsonica* Casey  
 1(1-4)C-36  
 36 *Coniontella argutus* Casey 1(1-4)D-37

## Subfamily PEDININAE (1-5)

## Tribe BLAPSTINI 1(1-5)

- 23 *Blapstinus vandykei* Blaisdell 1(1-5)A-38  
 34 *B. pubescens* LeConte 1(1-5)A-39  
 7 *Notibius substriatus* Casey 1(1-5)B-40  
 18 *Conibiosoma elongatum* (Horn) 1(1-5)C-41

## Subfamily OPATRINAE (1-6)

## Tribe LEICHENINI 1(1-6)

- 33 *Anemia californica* Horn 1(1-6)A-42

## Subfamily TENEBRIONINAE (1-7)

## Tribe TENEBRIONINI 1(1-7)

- 36 *Coelocnemis punctata* LeConte 1(1-7)A-43  
 33 *Alaephus nevadensis* Tanner, n. sp.  
 1(1-7)B-44  
 24 *Euposphulus castaneus* Horn 1(1-7)C-45

## Subfamily HELOPINAE (1-8)

## Tribe HELOPINI 1(1-8)

- 15 *Helops attenuatus* LeConte 1(1-8)A-46

## CLASSIFICATION OF THE TENEBRIONIDAE COLLECTED AT THE NEVADA TEST SITE

In this study the salient characteristics of the subfamilies, tribes, genera and species of the Tenebrionidae collected at the Nevada Test Site are presented in as simple a terminology as possible. It is hoped that these keys will be an aid to the student and layman in understanding and learning about this large, interesting family of beetles. Some technical terms will of necessity be used, but with the aid of the accompanying drawings (Figs. I-II), we believe that the descriptions and terminology may be understood.

The family Tenebrionidae is the largest family of beetles in the superfamily or assemblage of widely diverse families known as the Cucujoidea. The members of this family are com-

monly known as "Darkling Beetles" and are prevalent in the western United States, where they have become well adjusted to the dry desert conditions.

We are indebted to LeConte, Horn, Casey, Blaisdell, Bradley, Arnett and others for the use of their studies in the preparation of the following keys. We have selected, rearranged and added to the keys of these noted coleopterists. Rather than develop a short couplet key which is not easily used or understood by those not familiar with tenebrionid morphology, we have included rather lengthy characterizations of the several categories used in this classification.

The following suggestions are given to those who may use these keys. In order to determine

the species to which a given tenebrionid beetle may belong.

- A. First determine to which one of the eight subfamilies the specimen belongs. (1-1) to (1-8).
- B. Then, decide to which tribe of that subfamily the specimen belongs. 1(1-1), etc.
- C. Once it is placed in the proper tribe, one will not have too much difficulty in assigning it to the correct genus, e.g. 1(1-1)A.

- D. Many of the genera are monotypic. One need only turn to the page of the text and find the description of the species in question, e.g. 1(1-1)A-1. If there are more than one species reported for a genus, a key to the different species will be found under the genus heading.

The drawings of a representative species taken at the test site have the main structures labeled. Reference to these labeled drawings should help in understanding the terms used in the keys.

## THE FAMILY TENEBRIONIDAE

The family Tenebrionidae may be recognized and separated from other Heteromera Coleoptera as follows:

Front and middle tarsi five-jointed (Fig. 1); the hind tarsi four-jointed (Fig. 1); anterior coxal cavities closed behind (Fig. 11); ventral abdominal segments four and five, in part connate (Fig. 11); tarsal claws simple, the penultimate joint (Fig. 1) of the tarsi not spongy beneath.

Species of eight subfamilies are represented in the collections made at the test site.

### KEY TO THE SUBFAMILIES

#### (1-1) Subfamily TENYTRINAE

Ventral segments of the abdomen entirely of a horny substance; middle, or mesothoracic coxae without trochantins; labrum or upper lip scarcely visible. Female genitalia quadrato-triangular in shape, valvifer elongate, twice as long as wide; anal plate well developed, stylus rudimentary or entirely absent in some species. Male apicale longer than the basale; genital fossa large, widely open, apicale sides of basale inflexed ventrally in apical half, connecting surface broadly membranous, sides sclerotized.

#### (1-2) Subfamily ASIDINAE

Epistoma, or lower face between the mouth and eyes (Fig. 1) truncated, with the margin cut into sinuses; labrum well developed, mandibles thick, punctate, wide apically, with tip bifid; antennae with segments nine and ten wider than the eleventh which is imbedded in the concave apex of the eleventh; mentum large to moderate in size, attached to a gular extension

which may in some genera fill the entire buccal opening; prothorax much wider than the head, and narrower than the elytra; legs relatively small, given to show movements. Genera and species subject to considerable variations. Female genitalia strongly sclerotized, coxites and valvifers elongate, styli small; the terminal abdominal segments of the female are capable of being protruded to a remarkable length. Male aedeagus slender and elongate; apicale is as long as the basale and four times as wide (See figures 1 and 11).

#### (1-3) Subfamily ELEODINAE

The principal characters of the above subfamily are these: mesocoxae have visible trochantins (Fig. 11); the ventral abdominal segments are entirely corneous; eyes not prominent, more or less transverse, always emarginate in front; next to the last joint of tarsi entire, not bilobed; hind joint of antennae usually longer than the following; hind coxae transverse, never oblique; tarsi spinose or setose beneath; elytra widely embracing the body. The genitalia of the male is elongate flaxseed-shaped, apicale triangular with sides evenly arcuate, especially in the middle one-third; dorsal surface with an oval, slightly impressed semi-membranous area. Valvifers narrowly inflexed ventrally. The female genital segments similar in structure throughout the subfamily (See figures 1 and 11).

#### (1-4) Subfamily COXISTINAE

Middle coxae with visible trochantins. Labrum prominent, in great part visible. The abdominal intercoxal process acute and triangular. The mentum moderately emarginate, the ligula prominent and emarginate. The apicale of the male genitalia is elongate, several times as long



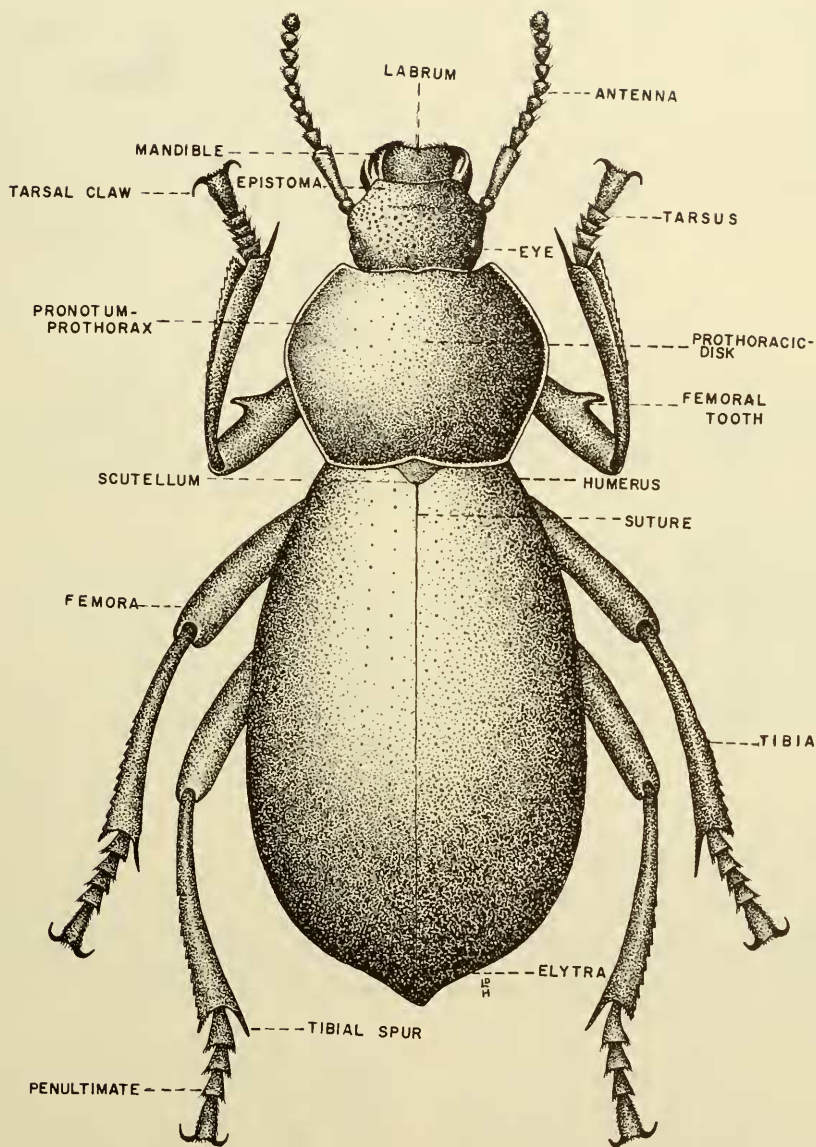


Figure 1. *Eleodes grandicollis valida* Boheman, dorsal view.

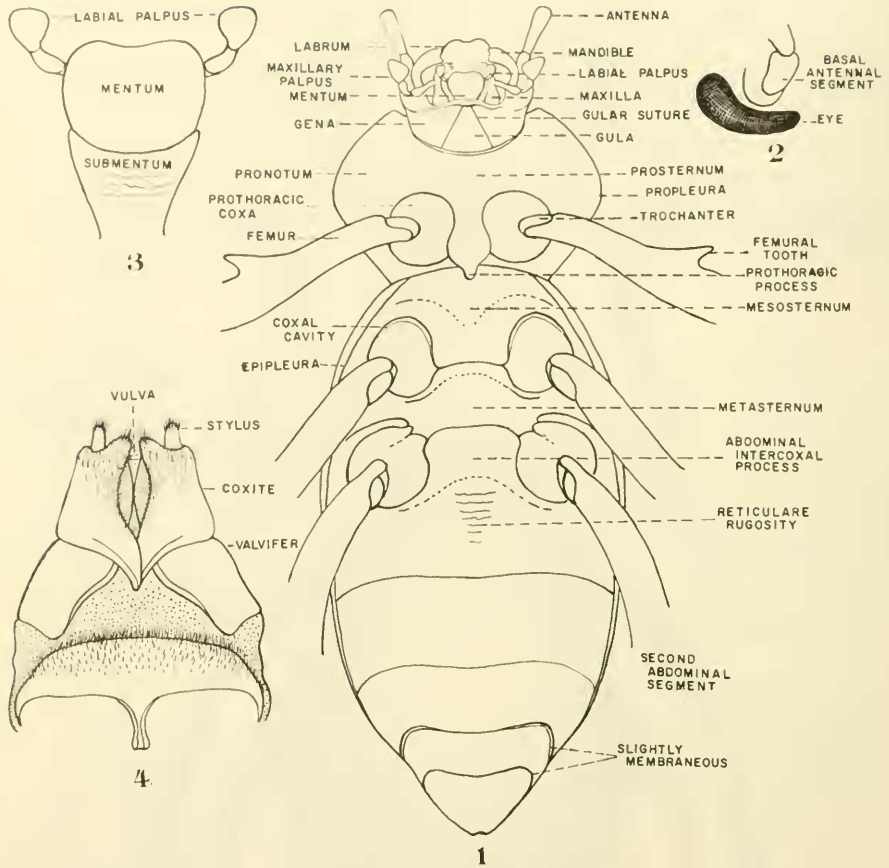


Figure 11. *Eleodes grandicollis valida* Boheman, ventral view.

as wide, parallel in basal one-half, thence broadly arcuate and gradually convergent to apex, the latter emarginate at middle; valvifer short, twice as long as wide, distinctly shorter than the apicale. Female genitalia elongate with bacula as supports in the valvifers; coxites divided, stylus obsolete.

#### (1-5) Subfamily PEDININAE

Body oval, not very convex; epistoma emarginate covering the base of the mandibles; labrum or upper lip prominent; mentum generally trilobed in front, small; ligula or central part of the lower lip prominent; eyes transverse, sometimes divided; elytra embracing feebly the sides

of the abdomen; middle coxae with distinct trochantin; intercoxal process of abdomen truncate; anterior and sometimes the middle tarsi of the male dilated, and spongy beneath; hind tarsi sometimes pubescent and spinous.

#### (1-6) Subfamily OPATRINAE

Body oval, head received by the thorax as far as the eyes, which are transverse, strongly emarginate and coarsely granulated, epistoma emarginate, extending down over the mandibles, labrum prominent, mentum small, ligula prominent, or slightly emarginate, maxillae exposed; elytra with narrow epipleurae (Fig. 11), anterior coxae transverse or rounded.

## (1-7) Subfamily TENEBRIONINAE

Beetles of this subfamily have bodies that are elongated, head prolonged, not received in the thorax as far as the eyes, which are transverse and emarginate, epistoma truncate, not separated from the labrum by a clypeus. Antennae with eleven joints, external ones broadened; mentum small, elytra feebly covering the sides of the abdomen, epipleurae narrow; middle coxae with noticeable trochantin; legs long, tarsi clothed beneath with silky golden or coarse pubescence.

## (1-8) Subfamily HELOPINAE

Front of head with a leathery or horny margin or a leathery band between the front and labrum; sides of the front obliquely elevated; eyes transverse, emarginate and coarsely granulated; antennae thickened externally; mentum small; ligula prominent; sides of the prothorax separated by a margin from the disk, elytra with narrow epipleurae; middle coxae with distinct trochantin; tarsi slender, head not deflexed.

## CHARACTERISTICS OF THE TRIBES, GENERA, AND SPECIES

## (1-1) Subfamily TENTYRIINAE

Species from nine tribes of Tentyriinae are included in this report. Each tribe and the genera are characterized below. The species of each genus are described in the text of this study.

## 1(1-1) Tribe EURYMETOPINI

Middle coxae without trochantin; mentum very large, concealing both ligula and maxillae; anterior tibiae with two terminal spurs, not toothed externally near the middle; mandibles never grooved externally; posterior coxae more or less separated, the abdominal process acute to broadly rounded; elytra not embracing the sides of the body, the inflexed parts occupied wholly by the epipleura; mentum hexagonal, apex emarginate or sinuate; front without a prolonged epistoma clasped by the mandibles, the right mandible at least generally with a tooth which clasps the labrum only. Antennae slender, outer four segments broader; scutellum well developed; body generally winged, though often apterous.

The following three genera, *Metoponium*, *Hylocrinus* and *Steriphanus*, each represented by a single species, were collected at the test site.

1(1-1)A. Genus *Metoponium* may be characterized as follows:

Anterior tibia produced externally at tip; eyes large, head with a distinct supra-orbital ridge or keel; epistoma never emarginate; mandibles ridged externally above; antennae slender, extending about to the base of the prothorax, last four joints broader compressed, the eleventh as long as the tenth or

longer and pointed; scutellum distinct; elytra never strongly rugose and usually with distinct serial punctures; tarsi beneath with long, stiff setae; prothorax generally fully as wide as the elytra.

In 1907 Col. Casey described many species of *Metoponium* from Arizona and California. The senior author spent considerable time in June, 1964 studying the Casey collection and species of this genus. It is our opinion that the Casey complex of species in this genus must be revised before dependable reference to species of this genus can be made. We are therefore considering specimens of this genus as *convexicollis* LeConte 1(1-1)A-1. For a description of this species see page 16.

1(1-1)B. Genus *Hylocrinus* has the following characteristics:

Anterior tibia not externally prolonged at tip, antennae long and slender, eyes large, not deeply emarginate; body elongate, parallel; surface glabrous; tarsi with sparse, stiff setae beneath.

A single species, *laborans* Casey, 1(1-1)B-2, belonging to this genus was collected at Mercury. The species description is given on page 17.

1(1-1)C. Genus *Steriphanus* has the following characteristics:

Body oval, convex, glabrous, devoid of hind wings; tarsi spinulose or sparsely and very coarsely setose beneath; normal, subcylindrical; the anterior nearly straight as usual; frontal margin generally feebly sinuate-truncate, not evidently bicarinate. A single species, *lubricans* Casey 1(1-1)C-3 is described on page 17.

## 2(1-1) Tribe AUCHMOBIINI

Middle coxae without trochantin; mentum very large, concealing both ligula and maxillae; anterior tibiae with two terminal spurs, not toothed externally near the middle; mandibles never grooved externally; posterior coxae more or less narrowly separated, the abdominal process acute to broadly rounded, the elytra not embracing the sides of the body, the inflexed parts occupied wholly by the epipleura; mentum hexagonal, with the apex more or less distinctly emarginate; front with the epistoma (absolutely) prolonged; epistomal lobe not clasped by the mandibles, which are folded beneath it out of sight from above. Antennae gradually enlarged and compressed outwardly.

The only genus in this tribe is *Auchmobius*, 2(1-1)A, which was revised by Blaisdell in 1934. At this time he described seven new species. The Mercury species is considered by us to be *sub-boreus* Blaisdell 1(1-1)A-4. See the text, page 17, for description of this species.

## 3(1-1) Tribe TRIMYTINI

Similar to Auchmobini except that the epistomal lobe is clasped by the superior external ridge of the mandibles; antennae filiform, generally with the last four joints larger; scutellum well developed as in *Eurymetopini*; body winged or apterous, the metasternum with or without ante-coxal grooves.

3(1-1)A. Genus *Chilometopon* has the following characteristics:

Outer ridge of the mandibles very narrow with a small dentiform protuberance at the base; body elongate, convex glabrous, fully winged; eyes large, prominent and only slightly emarginate anteriorly; tarsi long, the basal joint of the posterior variable; prothorax always narrowed toward the base, and widest before the middle; last antennal joint elongate, sometimes extremely so.

One species, *abnorme* (Horn) 3(1-1)A-5, is described on page 18.

## 4(1-1) Tribe EPYTRAGINI

Middle coxae without trochantin; mentum very large, concealing both ligula and maxillae; anterior tibiae with two terminal spurs; not toothed externally near the middle; mandibles never grooved externally; posterior coxae narrowly separated, abdominal process acute to broadly rounded; elytra not embracing the sides of the body; mentum transversely parallelo-

gramic, the apex very broadly arcuate from side to side and not sinuate at the middle, generally much more transverse.

4(1-1)A. Genus *Metopoloba* has the following characteristics:

Prosternum horizontally produced posteriorly, the tip received within a large deep mesosternal excavation; eyes large but not prominent, generally finely faceted and but feebly emarginate anteriorly; tarsi with sparse, short, stiff spiniform setae beneath the posterior, at least, devoid of denser and finer pubescence; supra-orbital ridges strong, eyes coarsely faceted; body elongate, pointed behind, basal joint of the hind tarsi at least equal in length to the fourth and usually longer; sculpture rather coarse and sparse, surface polished.

The species *bifossiceps* Casey 4(1-1)A-6, is described on page 18.

## 5(1-1) Tribe TRIOROPHINI

Middle coxae without trochantin; mentum large, concealing both ligula and maxillae; anterior tibiae with two terminal spurs, not toothed externally near the middle; mandibles never grooved externally; posterior coxae narrowly separated, the abdominal process acute to broadly rounded; elytra embracing the sides of the body, the inflexed parts not wholly occupied by the epipleura.

5(1-1)A. Genus *Triorophus* has the following characteristics:

Epistomal lobe parallel, very prominent, angulate at apex, clasped toward base by the swollen basal parts of the mandibles; the latter stout, each with a strong dorsal tooth clasping the labrum; eyes transverse, emarginate anteriorly; prothorax margined at the sides; elytra inflated, with abbreviated series of coarse punctures, epipleura narrow; legs long, tarsi with sparse spinules beneath; lateral lobes of front tuberculate; sides of pronotum with a distinct marginal bend, its base not bisinuate.

The species *laevis* LeConte, subspecies *politus* Casey 5(1-1)A-7 is described on page 19.

## 6(1-1) Tribe EDROTINI

Middle coxae without trochantin. Mentum very large, concealing both ligula and maxillae; anterior tibiae with terminal spurs, not toothed externally near the middle; mandibles never grooved externally; posterior coxae widely sep-

arated, the abdominal process broadly truncate; mesosternum without ante-coxal grooves; the body wingless; elytra frequently costulate; mesosternum elevated, flat, abutting closely and on the same plane against the apex of the flattened prosternal process; hind coxae transversely oval.

6(1-1)A. Genus *Edrotes* has the following characteristics:

Body rounded, convex, with conspicuous erect hairs; head large, epistomal lobe quadrate, with its sides parallel and sinuate, and apex broadly angulate nearly as in *Triorophus*; mentum transversely hexagonal, the apex trisinuate; eyes small, convex, prominent, and unemarginate; antennae long and slender, outer joints larger, the eleventh pyriform and long; prothorax with prominent and acute apical angles, strongly transverse; scutellum obsolete; elytra inflated and widely embracing the body beneath; epipleurae short; legs long, slender, the hind tarsi short, sparsely spinose and not at all grooved beneath, with long flying hairs above as on the femora and tibiae externally; hind coxae transverse, separated by less than their own width.

Description of the species *orbis* Casey 6(1-1)A-8, is on page 19 of the text.

#### 7(1-1) Tribe ARAEOSCHIZINI

Middle coxae without trochantin; mentum generally small in size, never concealing both the ligula and maxillae; elytra without true epipleura; anterior coxae separated; antennae moderately long, thick, filiform and perfoliate, usually scaly, free; legs short and stout.

7(1-1)A. Genus *Araeoschizus* has the following characteristics:

Body elongate, convex, hind body pedunculate without humeral angles, the hind wings wanting; head elongate-oval, clypeus large; mentum rather large, flat, broadly truncate at apex; mandibles bifid at tip; eyes completely divided, coarsely faceted. The upper part elongate, sunken deeply between the prominent lateral margin and a strong supra-orbital ridge; antennae about as long as the head and half the prothorax, prothorax cordate, small; scutellum triangular scarcely passing the basal declivity of the elytra; coxae globular, moderately separated; legs short, stout, tarsi short, claws small, slender and arcuate.

*Sulcicollis* Horn 7(1-1) A-9, which is a very common species in this area, is described on page 20.

#### 8(1-1) Tribe ANEPSIINI

Middle coxae with trochantin; labrum scarcely visible; tarsi spinose beneath; antennae not filiform; anterior tibiae broadly dilated.

8(1-1)A. Genus *Anepsius* has the following characteristics:

Body rather stout, convex, glabrous; head trapezoidal, clypeus broadly and feebly sinuate towards the middle; eyes basal, more rounded and less coarsely faceted, usually divided by the thick anterior canthus; antennae slender, almost as long as the head and prothorax, third joint longer than the second; prothorax four-fifths wider than long; elytra equal in width to the prothorax, two and one-half times as long, oval, the sides evenly arcuate; legs short, slender, the anterior tibiae broadly dilated at apex, with the spurs distinct; tarsi short, sparsely spinose beneath.

*Brunneus* Casey 8(1-1)A-10 was the only species of this genus collected at Mercury. It is described on page 21.

#### 9(1-1) Tribe CRYPTOGLOSSINI

Middle coxae with trochantin; labrum scarcely visible; tarsi spinose beneath; antennae not filiform; anterior tibiae slender. Eyes present; emarginate, reniform. Posterior margin of the last two abdominal segments semi-circularly emarginate.

Two genera are represented in the specimens taken at Mercury. They may be separated by the following key:

1. Last antennal segment truncate, smaller than the tenth .. 9(1-1)A *Cryptoglossa*
2. Last antennal segment oval, pointed, nearly as large as the tenth ..  
..... 9(1-1)B *Centrioptera*

A description of the species *Centrioptera muricata* LeConte, 9(1-1)B-12, is on page 23. *Cryptoglossa verrucosa* LeConte, 9(1-1)A-11 is described on page 23.

#### (1-2) Subfamily ASIDINAE

Two tribes of this subfamily are represented in collections from the Nevada Test Site.



## 1(1-2) Tribe ASIDINI

Body ovate, apterous; head narrowed behind the eyes, which are transverse and kidney-shaped; epistoma very short; mentum large; antennae eleven segmented; elytra embracing widely the flanks of the abdomen; epipleurae indistinct, middle coxae with distinct trochantin; metasternum short, with the episterna wide; hind coxae moderately separated; intercoxal process of abdomen obtuse; legs with tibial spurs distinct; tarsi setose, but not sulcate beneath.

Three genera are represented in this tribe.

1(1-2)A. Genus *Peleciphorus* has the following characteristics:

Mentum not entirely filling the buccal opening and always placed upon a rather evident pedicle formed by a gular prolongation; ligula small, generally flat, angularly emarginate to subtruncate and strongly retractile, usually hidden under the mentum, the latter always clearly separated from the closed mandibles; last joint of the maxillary palpi variable in size in the sexes; prosternum deflexed; body diversely sculptured, very much larger in size; tarsi with short and inconspicuous spiniform hairs beneath; base of the prothorax truncate or arcuate-truncate; head and prothorax generally smaller, giving the body a markedly different habitus; elytra each with distinct ridges as shown in Figure XIII.

Two species collected may be separated as follows:

1. Edge of pronotum unevenly scalloped, tuberculate, narrow; elytra very ventricose and tuberculate; outer coxa rather fine but strong, the inner very fine and subobsolete .....  
Fig. XIII, 1(1-2)A-13 *pantex* Casey  
See page 24 for description.

2. Edge of pronotum not scalloped, coarsely, sparsely and unevenly punctured, the sides narrowly reflexed; elytra elongate-oval, with distinct marginal costa, each with three nearly straight parallel, moderately elevated costa, the surface between the suture and first costa shining, the remainder opaque .....  
Fig. XIV, 1(1-2)A-14 *semilaetis* (Horn)  
See page 25 for description.

1(1-2)B. Genus *Euschides* has the following characteristics:

Mentum not entirely filling the buccal opening and always placed upon a pedicle formed by a gular prolongation; ligula large, tumid, angularly incised; mentum always separated from the closed mandibles, thus leaving the maxillary cardo exposed in part; prosternum deflexed posteriorly between the coxae; last joint of the maxillary palpi large and scalene in male, smaller in the female; base of the prothorax broadly lobed, becoming anteriorly oblique toward the sides, basal angle obtuse, sometimes evident but never prominent.

One species *luctatus* (Horn) 1(1-2)B-15 reported; see description on page 26 of text.

1(1-2)C. Genus *Trichiasida* has the following characteristics:

Mentum not filling the buccal opening and placed on a pedestal formed by a gular prolongation; ligula large, tumid, angularly incised; mentum separated from the closed mandibles, leaving the maxillary cardo exposed in part, prosternum deflexed posteriorly between the coxae. Last joint of the maxillary palpi differing but little sexually, never more than recti-triangular in the male; antennae more rapidly enlarged distally, the tenth joint with the usual two widely separated tomentose spots at the tip; elytra without true costae, the elevated lines when present having more or less the nature of narrow and accentuated obtuse ridges; body pubescent; mentum small, gular pedicle long and well developed; antennae slender; basal angles of prothorax never prominent; anterior tibiae serrulate externally, the outer angle at tip strongly everted and acutely spiniform.

One species *acerba* (Horn) 1(1-2)C-16; see page 26 for description.

## 2(1-2) Tribe CRANIOTINI

Middle coxae without trochantin; mentum large, concealing both ligula and maxillae; anterior tibiae with two terminal spurs, not toothed externally near the middle; posterior coxae widely separated; the abdominal process broadly truncate; body wingless; elytra frequently costulate; metasternum not elevated, discontinuous with the prosternum; hind coxae small, oval, much abbreviated transversely; eyes finely faceted; legs long and slender; female genitalia of the compact type, which is Asidini in nature.

2(1-2)A. Genus *Craniotus* has the following characteristics:

Body narrow anteriorly, inflated elytra; sparse to dense pubescence on the body; head small, projection at the sides anterior to the eyes extend beyond one-third the width of the head; transverse groove behind the epistome; mandibles bifid at tip, folding beneath the labrum; mentum large, sinuate at apex and emarginate at base; antennae long and slender, the third segment much elongated, the eleventh not free but small and received within the apex of the tenth; prothorax transversely suboval; scutellum elongate; elytra embracing the sides of the body, epipleurae narrow, disappearing before the middle of the abdomen; anterior coxae separated; metasternum short, convex at the sides; femora and tibiae long, slender and subcylindric, hind tarsi rather short, slender, and with long hairs above and short stiff spines beneath. Female genitalia of the elongate type (Fig. XVII, 2-3).

For description of the species, *blaisdelli* Tanner 2(1-2)A-17, collected on the test site, see page 27.

(1-3) Subfamily ELEODINAE

Ventral segments three and four with coraceous hind margin; front entirely coraceous; first joint of tarsi moderate or elongate, never very short tarsi, not compressed; eyes not prominent, more or less transverse, always emarginate in front; anterior tibiae alone or none dilated; penultimate joint of tarsi entire; anterior coxae rounded; middle coxae with trochanter; antennae perfoliate, third joint longer than the following; hind coxae transverse, never oblique; fourth segment of maxillary palpus triangular or securiform; epipleura attaining the sutural angle; tarsi spinose or setose beneath; elytra widely embracing the body.

1(1-3) Tribe ELEODINI

Body oblong, apterous, head prominent; epistoma covering the base of the mandibles at the sides; labrum prominent; mentum small, trilobed, inserted upon a gular pedicle; maxillae exposed, maxillary palpi with the last joint securiform, not very large; eyes transverse, reniform; antennae eleven jointed with the outer segments rounded, equal; elytra embracing widely the flanks of the abdomen, epipleurae narrow; middle coxae with large trochantin, side pieces attaining the coxal cavities; metasternum short, episterna narrow, epimera distinct; hind coxae widely separated; intercoxal process of abdomen rectangular; third and fourth ventral

segments not prolonged behind at margin. Legs long; anterior femora frequently toothed; tibial spurs distinct; tarsi channelled and setose beneath.

Key to the genera:

1. Sides of the epistoma not dilated, margin straight or sinuate, converging anteriorly ..... 2

Sides moderately dilated, margin arcuate ..... 1(1-3)A *Trogloclerus*

2. Epipleura attaining the humeral angles, broader at base, more or less gradually narrowing to apex, occupying only a part of the inflexed portion of the elytra; buccal processes of the genae not produced .... 1(1-3)C *Eleodes*

Epipleura very narrow, not attaining the humeral angles .. 1(1-3)B *Embaphion*

1(1-3)A. Genus *Trogloclerus* has the following characteristics:

Body elongate, rough, opaque; eyes transverse and reniform; head pierced with closely set, small holes; front prolonged, covering the labrum, sides dilated and reflexed; surface briefly convex at middle, transversely impressed with a small deep fovea on the vertex; antennae with third segment as long as the two following; prothorax emarginate in front, rounded on the sides, basal angles prominent; disc coarsely oribate; elytra with the suture and four costae each side acutely elevated; intercoxal process of first abdominal segment broader than long; under surface strongly granulate; anterior femorae armed with a small to broad tooth; front tibiae curved and serrate on the outer edge; tarsi setose.

This species, *costatus nevadus* LaRivers 1(1-3)A-18 is described on page 29.

1(1-3)B. Genus *Embaphion* has the following characteristics:

Thorax and elytra always acutely and sometimes broadly margined, margin more or less reflexed; epipleurae always narrow, rarely defined front (Figs. I and II) inflexed sides of the elytra, except at apex, where they are always well defined, not suddenly widened at base and never attaining the humeral angles of the elytra. Blaisdell made the following observation on the characteristics of this genus: "The above characters are distinctive of the genus and are not observed elsewhere in Eleodini."

One species of this genus was collected at the test site. See page 29 of this report for a description of *elongatum* Horn, 1(1-3)B-19.

The genus *Eleodes* 1(1-3)C has the following characteristics:

Mentum trilobed, middle lobe large and convex; apical joint of labial and maxillary palpi triangular; suture between epistoma and front distinct; eyes reniform; antennae with eleven segments, the last three usually compressed. Prothorax variable in shape and sculpture in some species prolonged into a cauda behind; epipleurae distinct. Legs fairly long, femora not strongly clavate, in some species armed in one or both sexes with teeth. Tarsi usually channeled and setose beneath, spurs of the middle and hind tibiae well developed.

The genus *Eleodes*, because of the large numbers of species referred to it, has been separated into thirteen subgenera. For the list and characteristics of these subgenera see Tanner's paper (1961), Checklist and New Species of *Eleodes*, pp. 60-61.

The species of *Eleodes* collected at the test site belong to six of the thirteen subgenera which may be separated by means of the following key:

#### Subgenus *Melaneleodes*

Anterior femora armed only in the male or mutic; anterior tibial spines dissimilar in the sexes; femora mutic.

##### 1(1-3)C-20 *carbonaria immunitis* LeConte

This is the only species of *Melaneleodes* we have collected on the test site. A description and discussion of the species will be found on page 29 of this report.

#### Subgenus *Eleodes*

Anterior femora at least, armed in both sexes (except in *caudifera* and *longipilosa* where teeth are abortive).

The species and subspecies of this subgenus may be separated as follows:

1. Body elongate; elytra strongly sulcate; intervals quite strongly convex, smooth, with a single series of irregularly, distantly spaced, feebly muricate punctures, which become decidedly muricate on the apical declivity. Sulci about equal in width to the intervals, with closely placed muricate punctures which become more densely placed toward apex; inflex sides of the

elytra obsoletely sulcate and irregularly muricately punctured. Size, males, 25 to 31 mm in length; width 9 to 14 mm

*obscura sulcipennis* Mann, 1(1-3)C-21  
Description on page 30 of report.

2. Body large, oblong oval, black and shining; head twice as wide as long, punctation irregular, denser at the periphery. Antennae short and stout, reaching to the posterior fourth of the prothorax; third joint equal in length to the next two taken together; pronotum widest at about the middle, disc smooth and shining, surface finely and sparsely punctate, punctures arranged in distinct unimpressed series; epipleurae narrow, gradually narrowing from the base to the apex; abdomen sparsely punctate, with some reticulate rugosity; legs not long but stout; anterior femora in both series armed with an acute tooth; female genitalia of the compact type (Fig. II-4); size: males 26 to 29 mm in length, 10 to 12 mm in width; females, 27 to 30 mm in length, 10 to 12 mm in width, Figs. 1 and 2  
*grandicollis valida* Boh. 1(1-3)C-22  
Description on page 31 of report.
3. Body elongate, ovate, integument dull and thick, black in color, frequently reddish along the suture; head and thorax more or less shining. Elytra slightly convex, sulci opaque and deep, intervals strongly convex and shining; antennae long, reaching the base of the prothorax; pronotum widest at the middle; disc smooth, finely sparsely punctate; epipleurae gradually narrowing from base to apex; abdomen smooth, finely punctulate and rugulose; fifth segment more strongly punctate; legs slender; anterior femora armed with an acute tooth in both sexes. Size: males 18 to 22 mm in length, 7 to 9 mm in width; females 19 to 24 mm in length, 8 to 10 mm in width  
*hispilabris sculptilis* Blais. 1(1-3)C-23  
Description on page 32 of text.
4. Body elongate, surface sparsely clothed with long, black hairs; caudate;  
*longipilosa* Horn 1(1-3)C-24  
Description on page 32 of report.
5. Body large, elongate suboval to sub-

fusiform-ovate; dull black in color, all the femora armed with long acute spines; elytra moderately striate .....  
 ..... *armata* LeConte 1(1-3)C-25  
 Description on page 33 of text.

6. Body smaller, punctuation fine and sparse, except on head; pronotum slightly wider than long, sides almost straight. Femoral teeth smaller and acute .... *armata pumila* Blais, 1(1-3)C-26  
 Description on page 33 of text.

Subgenus *Metablapyllis*

Anterior tibial spurs similar in the sexes. Tarsi similar in the sexes, or nearly so. Middle lobe of the mentum small; anterior tarsi comparatively simple beneath, groove entire. Lateral lobes of the mentum fully exposed; sculpturing comparatively simple; femora mutic.

The two following species of *Metablapyllis* may be characterized as follows:

1. Body elongate, usually about three times as long as wide. Head less than twice as long as wide, antennae moderate in length; eleventh segment ovate, truncate at tip; pronotum widest at or just in front of the middle, surface finely, densely and irregularly punctate, elytra widest at the middle, surface with fine punctures, usually arranged without order, and more or less striate; epipleurae widened beneath the humeri, then gradually narrowing to apex; legs moderate in length, mutic and stout. ....  
 ..... *nigrina* LeConte 1(1-3)C-27  
 This species is described on page 34 of this study.

2. Body cylindrico-fusiform, black, somewhat depressed, smooth, elytra striae rather distant; pronotum finely, but distinctly and sparsely punctulate; tibiae and tarsi with reddish-brown setae; spinules and tarsal claws strongly developed .....  
 ..... *dissimilis nevadensis* Blais. 1(1-3) C-28  
 Description of this species on page 34 of this report.

Subgenus *Steneleodes*

Anterior tarsi dissimilar in the sexes. Species not usually pubescent, rarely so. Form elongate usually large; first joining of the anterior tarsi slightly thickened at tip beneath, bearing a small

transverse tuft of yellowish or brownish modified spinules which interrupt the groove in the male; simple in the females.

The following is a brief characterization of the only species of *Steneleodes* taken at the test site:

Body elongate to elongate fusiform, black head twice as long as wide, finely punctate; antennae stout, pronotum widest at the middle; disc evenly convex, sparsely punctulate; sides finely margined; elytra elongate; base truncate; humeri obtuse; surface irregularly and evenly punctate; epipleurae rather wide at the humeri, gradually narrowing to apex; femora not densely punctate, the anterior mutic in both sexes .....

..... *longicollis* LeConte 1(1-3)C-29  
 For further discussion of this species see page 34 of this report.

Subgenus *Blapyllis*

Form short ovate, moderate in size to small, robust (elongate and depressed in *tibialis*); anterior tarsi of male with first two or three joints feebly thickened at tip beneath and clothed with dense silken or brownish tufts, obliterating the groove; joints simple with grooves entire in female, femora mutic.

The two species of this subgenus may be separated as follows:

1. Body oblong-oval, two-and-a-third times longer than wide; head twice as wide as long; antennae with four outer joints feebly compressed, third joint equal to the next two taken together; pronotum finely and densely punctate, widest at the middle and evenly arcuate from apex to base; elytra sculpturing consisting of small shiny tubercles arising from an opaque base .....  
 ..... *tenebrosa* Horn 1(1-3)C-30  
 Description on page 34 of report.
2. Body robust, convex, coarsely and densely sculptured; color dull black, legs dark brown; head large, two-thirds as wide as the prothorax, densely punctate; antennae longer than the head and prothorax, third joint four times as long as wide; prothorax evenly convex, coarsely, deeply and confluent punctate; elytra coarsely, densely, asperately punctate .....  
 ..... *brunnipes brevisetosa* Blais, 1(1-3)C-31  
 See page 35.

Subgenus *Lithlecodes*

Form ovate, moderate in size, less robust; first joint of the anterior tarsi more or less thickened and slightly more prominent ventrally than the others. pubescent tuft variable, most evident in *extricata*; male first joint with a minute tuft of silken pubescence at tip beneath.

1(1-3)C-32 *extricata frigida* LaRivers

This is the only species of *Lithlecodes* thus far taken at the test site. For additional comments on it see page 35 of this report.

## (1-4) Subfamily CONIONTINAE

## 1(1-4) Tribe CONIONTINI

Body oval or globose, apterous; epistoma covering the base of the mandibles; labrum prominent; mentum moderate, emarginate; gular penduncle short or almost obsolete; ligula prominent, emarginate; maxillae exposed; eyes transverse, small elytra usually with narrow epipleurae; anterior coxae subtransverse; middle coxae with distinct trochantin, side pieces of mesothorax attaining the coxal cavities; metasternum short; hind coxae approximate; intercoxal process of abdomen acute; tibial spurs long, tarsi spinous beneath; the first joint of hind tarsi long.

1(1-4)A. Genus *Sphaeriontis* has the following characteristics:

Elytra widely embracing the sides of the body, the epipleura variable; anterior tibiae with everted external angle at apex; basal joint of anterior tarsi long; prothorax always prolonged at the sides and enveloping the humeri; scutellum nearly obsolete; epipleura narrow, occupying much less than the entire inflexed sides of the elytra; epipleura gradually becoming wider basally, sometimes extending to the sides of the elytra at base; sides of the elytra always obtusely rounded in sections, never acutely margined; antennae slender, dilated apically; intercoxal process obtuse, the coxae more widely separated throughout; body more broadly rounded, very convex, the sculpture more muricate; propleura with more conspicuous hairs.

*Dilatata* LeConte 1(1-4)A-33 is the only species of this genus collected at the test site. Description of this species is on page 35 of report.

1(1-4)B. Genus *Eusattus* has the following characteristics:

Similar in characteristics to *Sphaeriontis* except the intercoxal process of the abdomen is acute, the coxae throughout narrowly separated, body oblong-oval to parallel, moderately convex; propleura with or without bristling hairs.

Two species of this genus, *dubius* and *agnatus*, collected at Mercury may be separated as follows:

1. A small species; length 7.8 to 8.5 mm; width 4.2 to 4.6 mm. Body elongate, convex, polished; prothorax two and one-half times as wide as its median length; elytra narrow and elongate, almost a third longer than wide, punctures fine, but distinct; anterior tibiae only feebly serrulate externally .....  
..... *dubius* LeConte 1(1-4)B-34

For further information on this species see page 36 of this report.

2. A larger species; length 8.9 to 9.8 mm; width 5.1 to 5.7 mm. Body broadly oblong-oval, moderately convex, subglabrous; prothorax not two and one-half times as wide as its median length; elytra elongate, as wide as the prothorax, parallel, surface feebly rugose, with sparse small muricate punctures; anterior tibiae strongly sinuate externally beyond the middle .....  
..... *agnatus* Casey 1(1-4)B-35  
This species is discussed on page 36 of the report.

1(1-4)C. Genus *Coniontis* has the following characteristics:

Elytra narrowly embracing the sides of the body, the epipleura constantly narrow and occupying the entire inflexed part; the basal joint of the anterior tarsi short, obliquely truncate at tip; prothorax variable at base, but generally more truncate; scutellum well developed, triangular; posterior angles of the prothorax strongly posteriorly produced; palpi more elongate than usual, last three joints of the antennae moderately dilated; basal joint of the anterior tarsi longer than the next two combined; obliquely prominent internally at tip, two to four transverse, rapidly diminishing in size.

*Nevadensis carsonica* Casey 1(1-4)C-36 is the only species of this genus collected at the test site. See page 36 of the text for description of the species of this genus.



1(1-4)D. Genus *Coniонтellus* has the following characteristics:

This genus is similar to *Coniонтides*, except that the posterior angles of the prothorax are feebly produced posteriorly, the thoracic base frequently subtruncate; eyes completely divided; body smaller, the legs and antennae shorter.

A single species of *Coniонтellus argutus* Casey, 1(1-4)D-37 was collected. See page 37 of text for species description.

(1-5) Subfamily PEDININAE

1(1-5) Tribe BLAPSTINI

Body oval; eyes completely divided; epistoma emarginate, the inflexed part of the elytra is composed entirely of the epipleurae; mentum not trilobed in front; dilation of the anterior tarsi of the male feeble; presence or absence of a fringe of setae along the lateral edges of the body.

1(1-5)A. Genus *Blapstinus* has the following characteristics:

Scutellum triangular, separating the elytra at base, the hind wings frequently well developed and the anterior tarsi of the male dilated as a rule; base of the prothorax bisinuate; anterior tibiae straight; pubescence simple; body usually oblong or oblong-oval, the sides not fimbriate; anterior tibiae simple.

Two species of this genus may be separated with the aid of the following:

1. Small species. Length 5.0 to 5.1 mm, width 2.5 to 2.6 mm. Color nigra piceous, frontal margin, labrum and legs more or less rufous; pubescence fairly dense, decumbent and confined to the intervals; head small widest just before the eyes; epistoma emarginate over the labrum; pronotum about two-fifths wider than long; disc densely and evenly punctate; elytra twice as long as wide; striae distinct, punctures small; legs moderate in length and stoutness .....  
..... *candykei* Blais. 1(1-5)A-38

See page 37 of report for discussion of this species.

2. Large species. Length 6.4 to 6.5 mm. Width 3.0 to 3.1 mm. Color deep reddish brown; pubescence yellowish, dense and decumbent on head, pro-

thorax and elytra; upper portion of eyes large, round and flat; punctation on head and prothorax dense and deep; distal three segments large and oval; legs moderate in length, first and fourth tarsal segments about equal in length .....  
..... *pubescens* LeConte 1(1-5) A-39  
This species is discussed on page 37 of this report.

1(1-5)B. Genus *Notibus* has the following characteristics:

Eyes entirely divided; scutellum very short and broad, not entering the disc of the elytra; apterous; male tarsi not dilated; prothorax laterally densely fimbriate; anterior tibiae broadly triangular and compressed; body stout, oblong-oval.

One species, *Notibus substriatus* Casey 1(1-5)B-40, described on page 37 of this study.

1(1-5)C. Genus *Conibiosoma* has the following characteristics:

Eyes entirely divided; scutellum very short and broad, not entering the disc of the elytra; apterous; male tarsi not dilated; prothorax laterally densely fimbriate; anterior tibiae narrow, non-fossorial; body narrow and parallel. *Conibiosoma elongatum* (Horn), 1(1-5)C-41.

A description of this monotypic species will be found on page 38 of this text.

(1-6) Subfamily OPATRINAE

1(1-6) Tribe LEICHENINI

Specimens of this tribe have the fourth segment of the maxillary palpus elongate-oval; more or less finely acuminate.

1(1-6)A. Genus *Anemia* has the following characteristics:

Anterior tibiae not bent; vestiture not composed of short coarse recumbent hairs and long, erect, very robust bristles; anterior tibiae strongly dentate or produced externally at or near the apex; eyes completely divided, or extremely nearly so; epipleura entire; anterior tibiae short, triangular.

This genus is also a monotypic one. See page 38 for description of *Anemia californica* Horn, 1(1-6) A-42.

## 1(1-7) Subfamily TENEBRIONINAE

## 1(1-7) Tribe TENEBRIONINI

Body elongate, apterous, or winged; head prolonged; front dilated on the sides, covering the base of the mandibles; antennae gradually thickened externally; elytra embracing feebly the sides of the abdomen; anterior coxae globose; legs long, tibial spurs small; hind margin of third and fourth ventral segments subcoriaceous.

1(1-7)A. Genus *Coclocnemis* has the following characteristics:

Tarsi with fine, usually silken pubescence beneath; outer segments of antennae with disc-like expansions connected by a stock passing nearly through their centers; antennae shorter than head and thorax; epipleura not attaining the tips of elytra; intercoxal process of abdomen broad, truncate.

The description of *C. punctata* LeConte, 1(1-7)A-43 will be found on page 39 of this study.

1(1-7)B. Genus *Alaephus*:

Tarsi spinose or setose beneath; antennae elongate, slender, palpi long, tarsi slender; mentum emarginate. A single species of this

genus taken at Mercury is closely related to *pallidus* Horn.

See page 39 of this text for description of *Alaephus nevadensis* Tanner n. sp. 1(1-7)B-44.

1(1-7)C. Genus *Eupsophulus*:

This genus is similar to *Alaephus* differing in that the mentum is truncate in front. One species, *castaneus* Horn 1(1-7)C-45. See page 40 for description.

## (1-8) Subfamily HELOPINAE

## 1(1-8) Tribe HELOPINI

1(1-8)A. Genus *Helops*:

Body glabrous. Outer segments of antennae compressed; labrum prominent, clypeal membrane always visible; head usually prolonged behind the eyes; elytra feebly embracing the body. Epipleurae entire, anterior coxae globular; tarsi densely pubescent beneath; mesosternum short; intercoxae process broad or oval, never acute at tip.

One apterous species *attenuatus* LeConte, 1(1-8)A-46 is described on page 40 of this study.

## SYSTEMATIC AND ECOLOGICAL DISCUSSION OF THE SPECIES OF TENEBRIONIDAE COLLECTED AT THE NEVADA TEST SITE

1(1-1)A-1 *Metoponium convexicollae* LeConte

References. LeConte, Ann. Lyc. N. H. N. Y., V, 1851, pp. 125-216. Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 309.

**Morphological Characteristics.** Length 6 to 7.5 mm; form stout; oblong; rather convex; chestnut brown to deep reddish black. Head somewhat coarsely and closely punctate; supra-orbital carina prominent. Antennae fairly long and slender, the last four segments lightly compressed and dilated. Pronotum about as wide as the elytra; rather evenly arcuate, converging slightly more anteriorly than posteriorly; punctures strong laterally and becoming finer medially; scutellum transverse and oval. Elytra obtusely rounded at tip; coarse punctures in series which become confused toward the base. Legs short and stout.

**Plant Community Relationships.** A total of 277 specimens was collected. These were most

abundant in the disturbed Grayia-Lycium with about one-ninth this number in Larrea-Franseria and one-fourth in Salsola. A few were collected in the Grayia-Lycium and Mixed communities, but none was found in Atriplex-Kochia, Coleogyne, or Pinyon-Juniper.

**Seasonal Activity.** This species was collected from February to December, but was most abundant from April through June. There was a decline in numbers collected during July and August followed by another population peak in September and October. In the disturbed Grayia-Lycium the period of activity was from February through December, whereas in Larrea-Franseria, Lycium, and Salsola it did not begin until March and April and lasted only until October. In the Larrea-Franseria, activity of this species stopped in August.

**Comments.** At the time Casey (1907) established this genus he was the author of all its

members except two species, *M. abnorme* and *M. convexicollis*, which had previously been named by LeConte. Since then, Blaisdell described four more species. Because Casey believed that there was little or no variation in a species, he named many new ones that today are considered synonyms. Representatives from our series were studied by Dr. Spilman at the National Museum and the senior author who compared them with the specimens in the Casey collection. Until this genus is revised and the validity of the Casey species determined, we propose to report this species as *convexicollis*. This was the ninth most common species at the site.

1(1-1)B-2 *Hylocrinus laborans* Casey

**Reference.** Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 337.

**Morphological Characteristics.** Length 6 to 8 mm; oblong-oval, rather convex; varies from dull to shining; reddish brown. Head finely and densely punctate; slight supra-orbital carina; eyes large, protruding, and entire; antennae reaching the base of the pronotum. Pronotum finely and densely punctate throughout; anterior apical angle short and broadly acute. Elytra wider than pronotum; twice as long as wide, punctures feeble, close-set, and arranged in lines between the intervals. Legs slender, relatively short compared to the body.

**Plant Community Relationships.** A total of 31 specimens was collected. The greatest number occurred in the Grayia-Lycium community, with about two-thirds of this number in the Lycium and Mixed communities. Disturbed Grayia-Lycium areas supported slightly fewer than half, whereas Larrea-Franseria had only one-third as many as Grayia-Lycium. Salsola had one-ninth as many as disturbed Grayia-Lycium. They were not found in Atriplex-Kochia, Coleogyne or Pinyon-Juniper.

**Seasonal Activity.** This species first appeared in June. Beetles were most abundant during June and July, and persisted in smaller numbers until December. In August there was a decline in activity which increased again in September. Observed activity ceased in September in all communities except the Mixed. There was no apparent activity in October or November but in December activity was noted again in the Mixed community.

**Comments.** This genus was established by Casey (1907) to contain sixteen species he described from the Great Basin and contiguous

areas. A comparison of specimens in question was made by the senior author with the Casey species. It is most difficult to differentiate between the species of the *laborans* group from the Utah-Nevada areas. Without an anatomical study we conclude that the Mercury specimens should be considered as *laborans*.

I(1-1)C-3 *Steriphanius lubricans* Casey

Figure IX-H

**Reference.** Casey, Proc. Wash. Acad. Sci. IX, 1907, p. 345.

**Morphological Characteristics.** Body narrowly oval, convex, dark piceous, legs pale rufous; head deeply and closely punctate; sides converging and arcuate, prothorax two-thirds wider than long, basal angles obtuse and slightly blunt; punctures strong and fine, becoming dense and longitudinally confluent toward the sides; scutellum broadly rounded; clytra nearly one-half longer than wide, the sides parallel, punctures small but deep; abdomen sparsely punctulate medially. Length 5.1 to 6.2 mm; width 2.3 to 2.7 mm.

**Plant Community Relationships.** Four specimens were collected in a Grayia-Lycium community between March 29, 1960 and April 17, 1961, and one in the Atriplex community on August 22, 1960.

2(1-1)A-4 *Anchmobius subborcus* Blaisdell

Figures III; IV-D; XV-E

**Reference.** Blaisdell, Trans. Am. Ent. Soc., LX, 1934, p. 254, pls. IXII, IVII, and IVIII.

**Morphological Characteristics.** Length 9.1 to 10 mm; width 4.3 to 4.8 mm. Form oval, twice as long as wide; color black, labrum and palpi rufous, also legs and apical antennal segments; sides of epistoma straight and convergent; surface of head evenly punctate; mentum about one-half wider than long; maxillary palpi slender; antennae attaining the pronotal base. Pronotum twice as wide as long, widest at the middle; disk convex from side to side, rather evenly punctate, punctures as on the frons. Elytra a third longer than wide, about three times as long as the pronotum. Disk punctation rather dense, fine and not distinct, more evident laterally and apically; legs moderate in length and slender; metatarsi more than two-thirds as long as the tibia.

**Plant Community Relationships.** Twelve specimens were collected in Grayia-Lycium communities between March 31, 1960, and Aug-

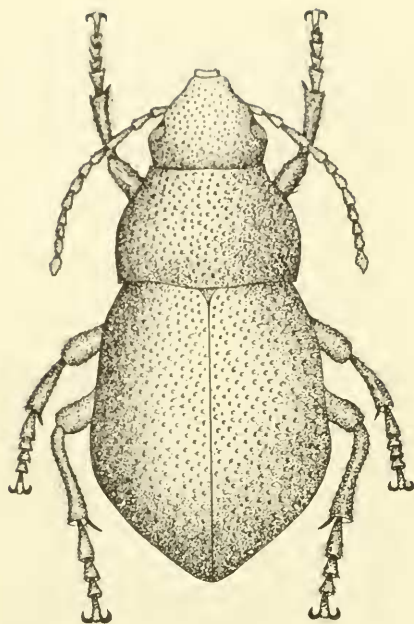


Figure III. *Auchmobius subboreus* Blaisdell.

ust 18, 1961. Eleven of the twelve were collected in 1960 in March, June, July and August. The other one was collected in August, 1961.

Twenty specimens were collected in *Larrea-Franseria* communities between July 9, 1960, and September 5, 1961, all but four in June, July, August and September, 1961. The other four were taken in July, 1960.

One was collected in a Pinyon-Juniper community on August 11, 1961.

Eight were collected in a Mixed community in the months of July, August and September, 1961.

### 3(1-1)A-5 *Chilometopon abnorme* (Horn)

Figures V-B: XV-G

References. Horn, Trans. Amer. Ent. Soc., V, 1874, p. 31. Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 372.

**Morphological Characteristics.** Length 5.5 to 7 mm, form oblong; body slight; chestnut brown. Near coarsely and densely punctate; eyes large, prominent, and subentire. Last segment of antennae as long as the next two together. Prothorax broader than long; narrower at apex than base; coarsely and densely punctured especially

toward the margins. Elytra wider than the pronotum; elongate-oval; sulci with finely intricate punctures. Legs moderately long and slender, the tarsal claws long and arcuate.

**Plant Community Relationships.** A total of 17 specimens was collected. They were found most abundantly in the *Larrea-Franseria* and *Artemisia* communities with one-fifteenth that amount in *Grayia-Lycium* and only a few found in the *Lycium*, *Salsola* and Mixed communities. They apparently were not present in the *Atriplex-Kochia* or *Coleogyne*.

**Seasonal Activity.** These beetles occurred from April to August with greatest abundance in July and August. They were first collected in April in the Mixed community. Activity in *Grayia-Lycium* began in June, whereas in other communities no activity occurred until July.

### 4(1-1)A-6 *Metopoloba bifossiceps* Casey

Figures IX-E; XIX-L

Reference. Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 413.

**Morphological Characteristics.** Length 6 to 7 mm; elongate; fusiform; polished; subglabrous; deep brown to nearly black. Head coarsely, irregularly, and sparsely punctate; supraorbital carina prominent, last four antennal segments dilated and compressed. Pronotum trapezoidal; truncate apically and bisinuate basally; coarsely punctate. Elytra bisinuate basally; coarsely punctate; broadly arcuate at the sides; blunt humeri; slightly widest behind middle; sparse irregular punctures throughout; scutellum wider than long. Legs rather slender, not long compared to the length of the specimen.

**Plant Community Relationships.** A total of 15 specimens was collected. The greatest number occurred in the *Grayia-Lycium*, with about three-fifths in the *Coleogyne*. A small number was found in the Mixed community. No specimens were collected in *Larrea-Franseria*, *Lycium*, *Atriplex-Kochia*, *Salsola* or Pinyon-Juniper.

**Seasonal Activity.** This species was active only in July in the *Coleogyne* and Mixed communities, whereas in the *Grayia-Lycium* and disturbed *Grayia-Lycium* communities activity continued through August. The number of specimens collected in each of these two months was almost identical.

**Comments.** Only a few *M. bifossiceps* were collected in the can traps. Most of them were taken while feeding on *Atriplex confertifolia*

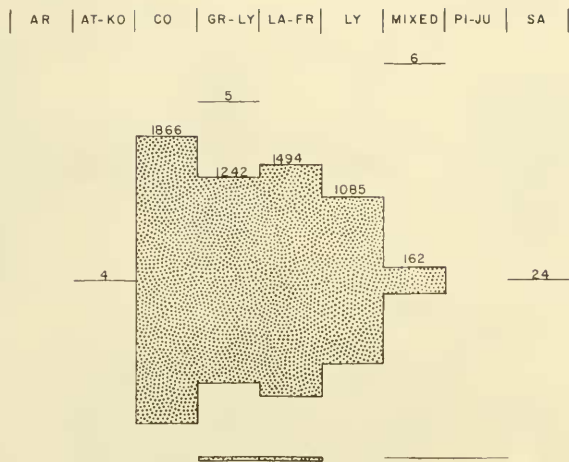


Figure IV. Number of specimens by species (A-D) found in nine plant communities. (In this and succeeding figure references to plant communities, the symbols stand for the following: AR=Artemisia, AT-KO=Atriplex-Kochia, CO=Coleogyne, GR-LY=Grayia-Lycium, LA-FR=Larrea-Franseria, LY=Lycium pallidum, MIXED=Miscellaneous, PI-JU=Pinyon-Juniper, SA=Salsola.)

during the middle of the day. A distinctive species.

#### 5(1-1)A-7 *Triorophus lactis politus* Casey

Figures IX-I; XX-F

**References.** LeConte, Ann. Lyc. N. York, V, 1851, p. 141. Lacordaire, Gen. Col., V, 1859, p. 48. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 259. Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 435.

**Morphological Characteristics.** Length 7 to 8 mm; elongate in form; color varies from chestnut brown to nearly black, most commonly very deep reddish-black. Head almost as wide as pronotum; sparsely punctate; two supraorbital folds at each side; antennae stout, with the tenth segment as long as wide. Pronotum punctate with stiff yellow pubescence. Elytra elongate-oval; strongly inflated; punctures arranged in nine series. Legs long and slender; tarsi spinous beneath.

**Plant Community Relationships.** A total of 867 specimens was collected. The greatest number was found in the Grayia-Lycium, with about four-fifths of this number in Larrea-Franseria. They were about two-fifths as abundant in Lycium, whereas the Atriplex-Kochia and Mixed communities supported about one-fifth as many specimens as the disturbed Grayia-Lycium. In

the Coleogyne community they were one-tenth as abundant, whereas in Salsola they were about one-thirtieth as abundant. The species was not found in Pinyon-Juniper or Artemisia.

**Seasonal Activity.** This species occurred in large numbers from April to October with single specimens collected in December, January and March. They were most abundant in May and declined steadily from then until October. In all communities beetles became active in April except in Salsola, where they were inactive until June. In Atriplex-Kochia they were active until June. Activity stopped in the Mixed community in August, whereas in Lycium and Coleogyne, activity continued through September. In the other communities they were active through October.

#### 6(1-1)A-8 *Edrotes orbis* Casey

Figures VI-A; XVI-D

**References.** LeConte, Ann. Lyc. N. York, V, 1951, p. 140. Lacordaire, Gen. Col., V, 1859, p. 31. Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 451. LaRivers, Ann. Ent. Soc. Amer., XL, No. 2, June, 1947, pp. 318-327.

**Morphological Characteristics.** Length 7 to 9 mm; form very round; convex; smooth; covered with short, erect, ashy-white hairs; varies from dull, grayish-black to highly polish, deep



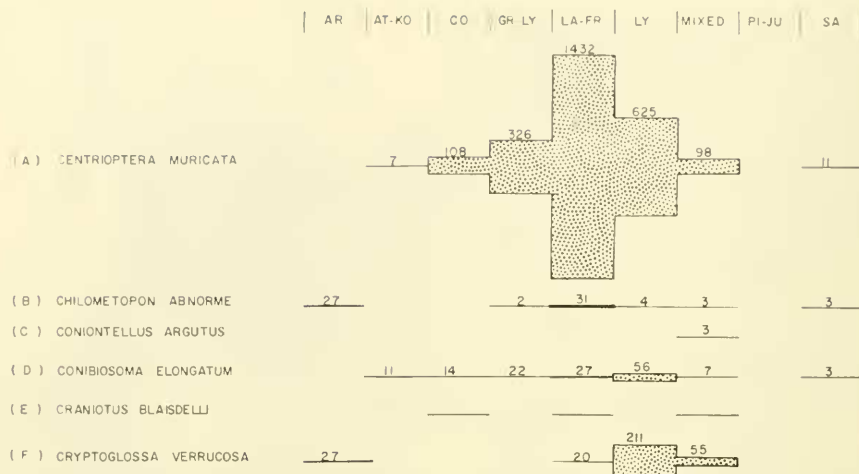


Figure V. Number of specimens by species (A-F) found in nine plant communities.

black. Head much narrower than the pronotum; the front very narrow. Pronotum four times wider than long, apical angle very acute and extended; well-separated tuberculate punctures. Elytra at least one and one-half times wider than pronotum; the punctures are minute and sparse; each puncture is behind a small abrupt tubercle. Legs fairly long; the hind femora reach the end of the abdomen.

**Plant Community Relationships.** A total of 2,005 specimens was collected. The greatest number occurred in Grayia-Lycium, whereas over half the number occurred in Salsola and one-third in Coleogyne. In Larrea-Franseria they were one-third as abundant, whereas Lycium supported only one-fifteenth as many. A few specimens were collected in the Atriplex-Koehia and Mixed communities, but none was present in Pinyon-Juniper and Artemisia.

**Seasonal Activity.** This species was active the year round in disturbed Grayia-Lycium, with the months of greatest activity being February, March, April and May. Months of least activity were June, July, November and December. Activity increased during the months of January, August, September and October. In the rest of the plant communities this species was active very little or not at all during May, June and July. The greatest period of activity in Larrea-Franseria and Lycium was during January and February, whereas in the Atriplex-Koehia, Salsola and Coleogyne communities the

period of greatest activity was in March. In these latter three communities there was little or no activity during November and December.

7(1-1)A-9 *Araeoschizus sulcicollis* Horn  
Figures IV-C; XV-D

**References.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 274; Trans. Amer. Ent. Soc., SVII, 1890, p. 341, Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 488.

**Morphological Characteristics.** Length uniformly 4 mm; body form slender; elytra flattened; dark reddish-brown with light yellowish scales. Head large; much elongated; converging from antennal prominences to basal angle; eyes divided, elongate and narrow above, small round beneath; antennae long; very stout and compressed; the eleventh segment very small and almost hidden in the apex of the tenth; covered with yellowish scales. Pronotum very small; widest anteriorly; sulcate along the middle from apex to base; sides fringed with close-set, yellow scales; the sulci deeply punctate. Legs fairly short and stout with no spines.

**Plant Community Relationships.** A total of 2,664 specimens was collected. They were found in greatest number in the Coleogyne and were only slightly less abundant in the Larrea-Franseria and Grayia-Lycium communities. They were about three-fifths as abundant in Lycium as in Coleogyne. A few specimens were collected

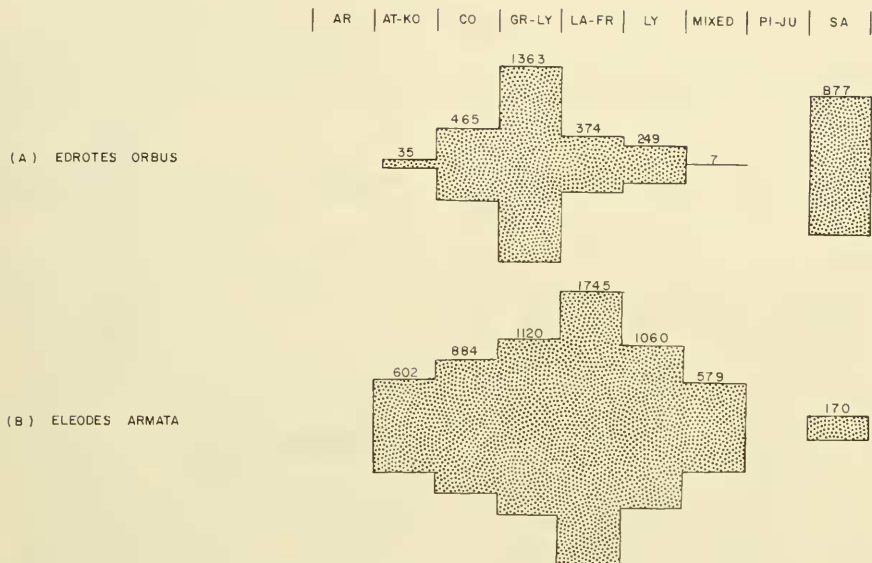


Figure VI. Number of specimens by species (A-B) found in nine plant communities.

in *Atriplex-Kochia* and *Salsola*, whereas none was found in the *Pinyon-Juniper* or *Artemisia*.

**Seasonal Activity.** This species occurred all the year round, being most abundant in September and April. The numbers declined in May, June and July, then increased in abundance through August to the population peak in September. Activity declined from October to February. In the disturbed *Grayia-Lycium*, *Grayia-Lycium*, and *Mixed* communities activity was evident every month of the year. In *Coleogyne* there was activity each month except December and February. Beetles were not active in the *Larrea-Franseria* community in January and February or in *Lycium* from December through March. In *Salsola* this species was taken in small numbers in May, June, September, October and November, whereas in *Atriplex-Kochia* it was collected only in July. It was not present in the *Pinyon-Juniper*.

8(1-1)A-10 *Anepsius brunneus* Casey  
 Figures IV-B; XV-B

**Reference.** Casey, Proc. Wash. Acad. Sci., IX, 1907, p. 506.

**Morphological Characteristics.** Length 4 to 4.5 mm; elongate; convex; reddish brown; shining. Head large; trapezoidal; strongly and closely

asperato-punctate; eyes completely divided with the upper lobe large and elongate; antennae long and slender. Pronotum wider than long; the anterior angles acute and prominent; finely punctate. Elytra slightly wider than the prothorax; humeri obtuse and distinct; very finely punctate in series. Legs fairly short and slender.

**Plant Community Relationships.** A total of 39 specimens was collected. They were most abundant in disturbed *Grayia-Lycium*, and about one-seventh as abundant in *Lycium* and *Grayia-Lycium*. A few specimens were taken in the *Salsola*, *Coleogyne* and *Mixed* communities. They were not found in *Larrea-Franseria*, *Atriplex-Kochia* or *Pinyon-Juniper*.

**Seasonal Activity.** This species was active from March through November, and most abundant in May. Beetles were about one-fourth as abundant during March and June as in May, with very few specimens collected in April and July through November. In disturbed *Grayia-Lycium* they were collected from March through June, and September through November. In the *Lycium* community they occurred in July and August, whereas in *Grayia-Lycium* they were active in May and June. In *Coleogyne* there was activity during April, during May in *Mixed*, and July in *Salsola*.

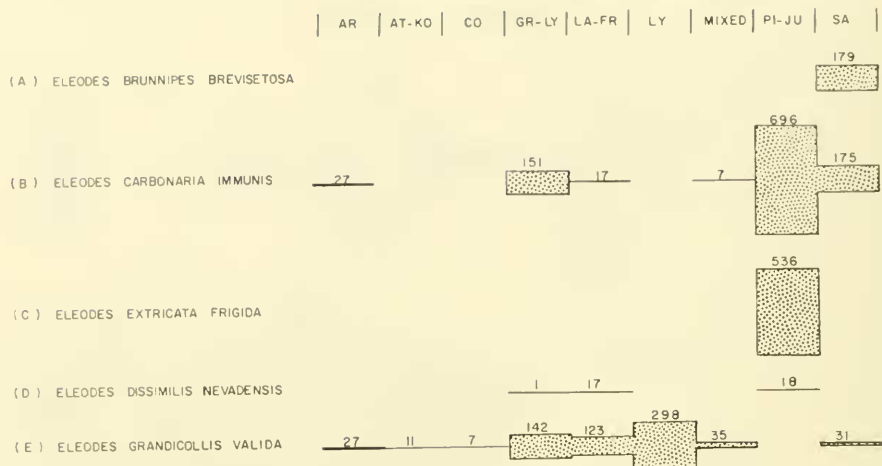


Figure VII. Number of specimens by species (A-E) found in nine plant communities.

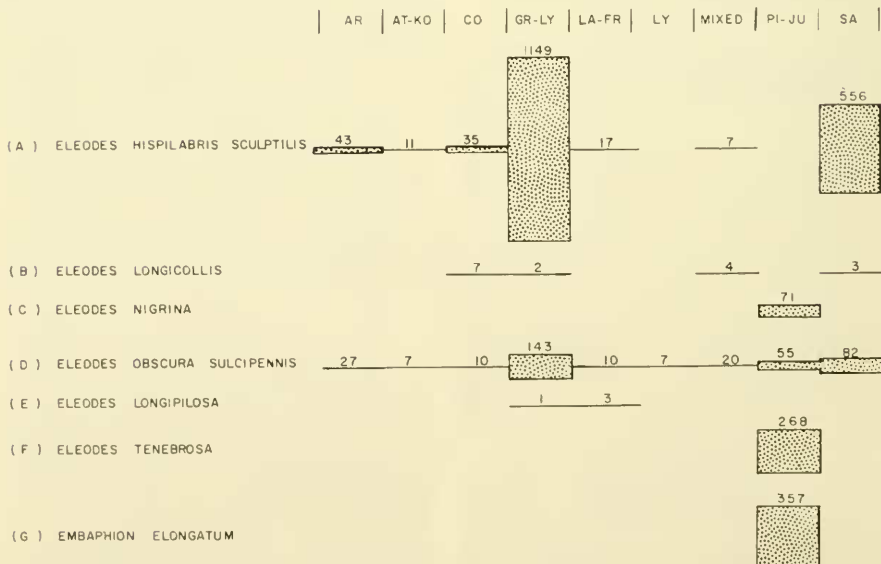


Figure VIII. Number of specimens by species (A-G) found in nine plant communities.

**Comments.** Although this genus was established by LeConte (1851), Casey (1892, 1907) named most of the species presently therein. Comparison of our series was made with specimens of *A. brunneus* Casey. This genus is in need of revision.

9(1-1)A-11 *Cryptoglossa verrucosa* LeConte  
 Figures V-F; XVI-C

**References.** LeConte, Ann. Lyc. N. York, V, 1851, p. 129. Lacordier, Gen. Col., 1859, p. 42. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 280. Triplehorn, Coleopterist's Bull., Vol. 18, No. 2, pp. 43-52, 1964.

**Morphological Characteristics.** Length 17 to 21 mm; form elongate-oval; very heavy appearance, light bluish-gray to deep black. Head, anterior front coarsely punctate; coalescent; the vertex granulate; eyes emarginate; antennae short and flattened with the eleventh segment truncate and much smaller than the tenth. Pronotum very rough and tuberculate; a medial suture extends from the apex to the base; apical angle acute and extended. Elytra evenly arcuate from base to apex; nine rows of large, evenly-spaced tubercles traverse the full length; apex

abruptly rounded. Legs long and stout; the tarsi covered with reddish-orange spines.

**Plant Community Relationships.** A total of 116 specimens was collected. The greatest number occurred in the Lycium community, with about one-fourth the number in Mixed, over one-tenth in Artemisia, and slightly fewer than one-tenth in Larrea-Franseria. They were not observed in Atriplex-Kochia, Grayia-Lycium, Salsola, Coleogyne, or Pinyon-Juniper.

**Seasonal Activity.** This species occurred from April to September, but was most abundant in August. One specimen was collected in November. Abundance was increased from May to June, declined slightly in July and then reached a peak in August. There was a large decline in September. In the Lycium and Mixed communities beetles were active from May to September, whereas in Larrea-Franseria activity was evident only during August and September.

9(1-1)B-12 *Centrioptera muricata* LeConte  
 Figures V-A; XV-F

**References.** LeConte, Ann. Lyc. N. York, V, 1951, p. 142. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 279.

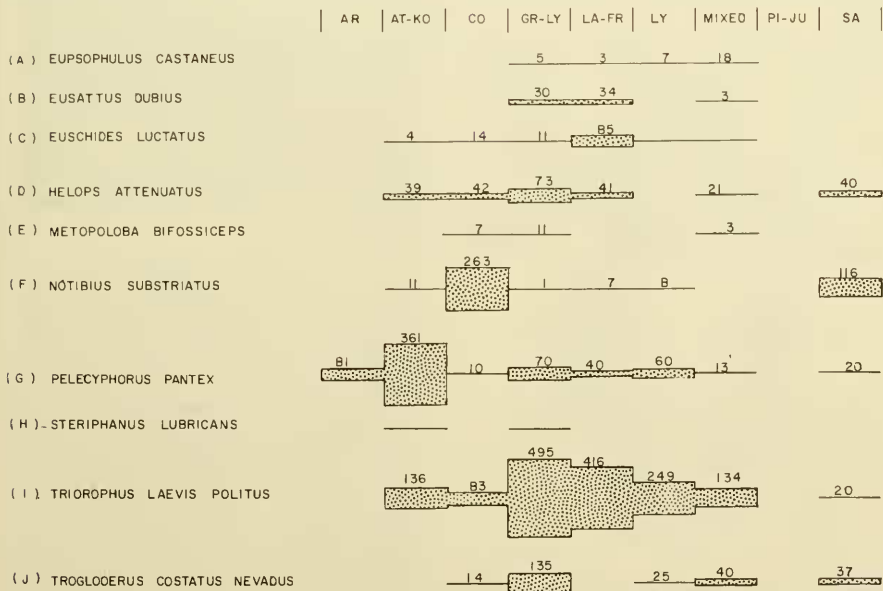


Figure IX. Number of specimens by species (A-J) found in nine plant communities.

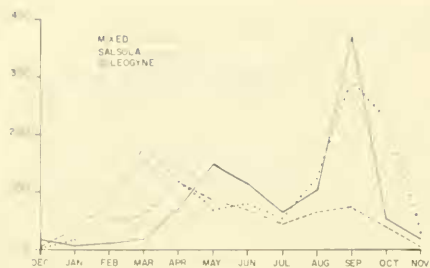


Figure X. Number of specimens seasonally in Mixed, Salsola, and Coleogyne communities.

**Morphological Characteristics.** Length 14 to 23 mm; form elongate; broadly rounded posteriorly; varying from dull gray to shining black. Head deeply and sparsely punctate; antennae moderate and stout, last segment oval and only slightly smaller than the tenth segment. Pronotum glabrous and shining; completely margined; deeply punctate laterally; punctures becoming very fine medially. Elytra elongate becoming broadly arcuate posteriorly; spiculae located along the lateral edges; becoming longer toward the apex. Legs moderately long and stout.

**Plant Community Relationships.** A total of 1,056 specimens was collected. The greatest number occurred in the Larrea-Franseria community, with about two-fifths the number in Lycium and one-fourth in Grayia-Lycium. The Coleogyne and Mixed communities supported about one-fourteenth as many beetles as Larrea-Franseria, whereas a few specimens were collected in Atriplex-Kochia and Salsola. They were not found in the Pinyon-Juniper or Artemisia communities.

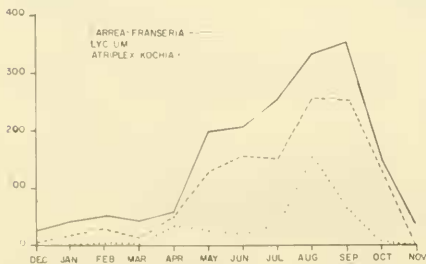


Figure XI. Number of specimens seasonally in Larrea-Franseria, Lycium, and Atriplex-Kochia communities.

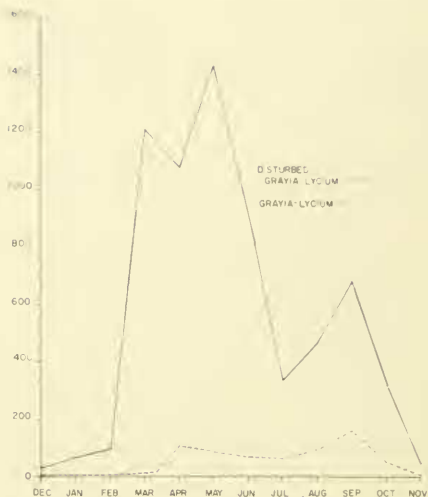


Figure XII. Number of specimens seasonally in disturbed Grayia-Lycium and Grayia-Lycium communities.

**Seasonal Activity.** This species was active from April through September, and was most abundant in June. From April to June, abundance of beetles increased, and from June to September, decreased. Beetles began activity in April in the Larrea-Franseria, Lycium, disturbed Grayia-Lycium, Salsola and Mixed communities. In all these except the Salsola community, activity continued until September. In Salsola the only other month in which they were active was June. In the Coleogyne community they were active from May to August, and in Atriplex-Kochia only in June.

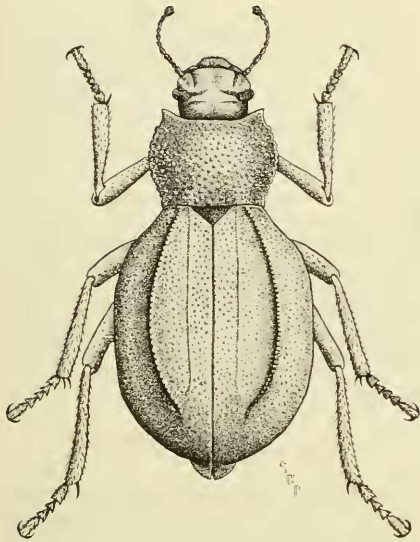
#### 1(1-2)A-13 *Pelecyphorus pantex* Casey

Figures IX-G; XIII; XX-B

**References.** Casey, Memoirs on the Coleoptera, III, 1912, p. 116. Tanner and Packham, Great Basin Nat., XXI, No. 4, 1962, p. 110.

**Morphological Characteristics.** Length 16 to 22 mm; form very ventricose; the anterior smaller than the posterior; deep black. Head not densely separately punctate; front somewhat dilated; last segment of antennae very small and partially surrounded by the tenth segment. Pronotum moderately convex; strongly granulate medially; edges slightly explanate with the sides unevenly scalloped. Elytra greatly inflated; surface granulate; the outer costa strong, the inner very fine to subobsolete. Legs fairly long



Figure XIII. *Pelecyporus pantex* Casey.

and stout; the anterior tibia slightly dilated at the apex.

**Plant Community Relationships.** A total of 228 specimens was collected. The greatest number occurred in the Atriplex-Kochia community, with slightly over one-fifth the number in Artemisia, Grayia-Lycium and under one-fifth in Lycium. In Larrea-Franseria they were about one-ninth as abundant as in Atriplex-Kochia, whereas their abundance in the Salsola, Coleogyne and Mixed communities was approximately one-twentieth. They were not found in Pinyon-Juniper.

**Seasonal Activity.** On March 31 in the disturbed Grayia-Lycium seven *P. pantex* were collected. No further activity was recorded until July. Except for this collection they occurred seasonally from July to October, being most abundant in August. Very few were collected in July, December and November, whereas they were slightly over one-third as abundant in September as in August. In the disturbed Grayia-Lycium they were active in March, July, August and September. Activity in Salsola occurred during July and August, whereas in Coleogyne they were active only in August. In the Atriplex-Kochia community they were active in August, September and November. In other communities where this species occurred they were active only in August and September.

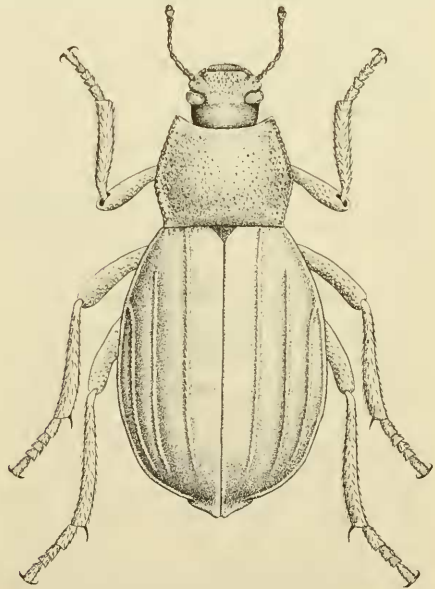
1(1-2)B-14 *Pelecyporus semilaevis* (Horn)

Figures XIV; XX-C

**References.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 284. Casey, Memoirs in the Coleo., III, 1912, p. 182. Tanner and Packham, Great Basin Nat., XXII, No. 4, 1962, p. 110.

**Morphological Characteristics.** Length 21 to 24 mm; form elongate-oval; narrowing from posterior to anterior, black. Head coarsely and sparsely punctate; front not dilated or only slightly so; eyes large and emarginate; third segment of antennae long; eleventh only slightly smaller than tenth. Pronotum coarsely, sparsely, and unevenly punctate; the sides are narrowly reflexed, moderately rounded and not scalloped. Elytra elongate-oval with distinct marginal costa; three straight, nearly parallel costa; the surface shining between the suture and first costa; the remainder opaque. Legs moderately long and stout; anterior tibia expanded apically into a spine.

**Plant Community Relationships.** A total of 31 specimens was collected. The greatest number occurred in the Atriplex-Kochia and the Grayia-Lycium communities and only two-fifths in disturbed Grayia-Lycium. Larrea-Franseria

Figure XIV. *Pelecyporus semilaevis* (Horn).

and *Lycium* supported about one-fourth the population of the *Atriplex-Koehlia*, whereas the *Coleogyne* and *Mixed* communities supported only about one-eighth. They were not found in *Salsola*, *Pinyon-Juniper* or *Artemisia*.

**Seasonal Activity.** *P. semilaevis* were collected only from July through September. They were most abundant in August. In all communities in which they were found they were active during this month. In *Lycium* and disturbed *Grayia-Lycium* they were active in July. Activity in all communities ceased in September.

1(1-2)C-15 *Euschides luctatus* (Horn)

Figures IX-C; XIX-J

**References.** Horn, *Trans. of the Amer. Phil. Soc.*, XIV, 1870, p. 286. Casey, *Memoirs on the Col.*, III, 1912, p. 155.

**Morphological Characteristics.** Length 12.5 to 17.5 mm; elongate oval; black. Head very sparsely punctate; eyes large and slightly protruding; second segment of antennae very short. Pronotum widely and acutely margined; sparsely punctate medially, more coarsely and densely punctate at margins. Elytra elongate-oval; without marginal costa or ridge; surface weakly granulate. Legs moderate and slender.

**Plant Community Relationships.** A total of 51 specimens were collected. The greatest number occurred in *Larrea-Franseria*, with about one-seventh the number in the *Coleogyne* and *Mixed* communities. A few specimens were found in *Grayia-Lycium*, *Atriplex-Koehlia* and *Lycium*, whereas none was found in *Salsola*, *Pinyon-Juniper* or *Artemisia*.

**Seasonal Activity.** This species was active from September to April. Beetles were most abundant during October, November, December and February. Activity was noted in disturbed *Grayia-Lycium* from September to January. In the *Mixed* community there was activity from October to February, whereas in *Coleogyne* beetles were active only during October and November. In *Larrea-Franseria* they were active from November to April.

1(1-2)D-16 *Trichiasida acerba* (Horn)

Figure XX-E

**References.** Horn, *Trans. Amer. Ent. Soc.*, VII, 1878, pp. 51-60. Casey, *Memoirs on the Coleoptera*, III, 1912, p. 176.

**Morphological Characteristics.** Length 11 to 14 mm; form elongate-oval; brownish elsewhere. Head sparsely punctate; antennae short, reach-

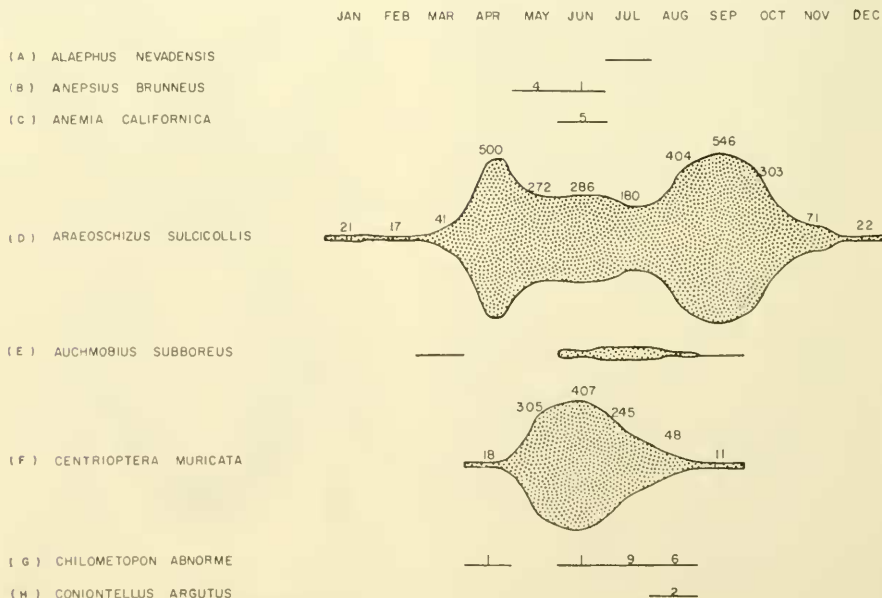


Figure XV. Number of specimens seasonally collected in all the biotic communities.

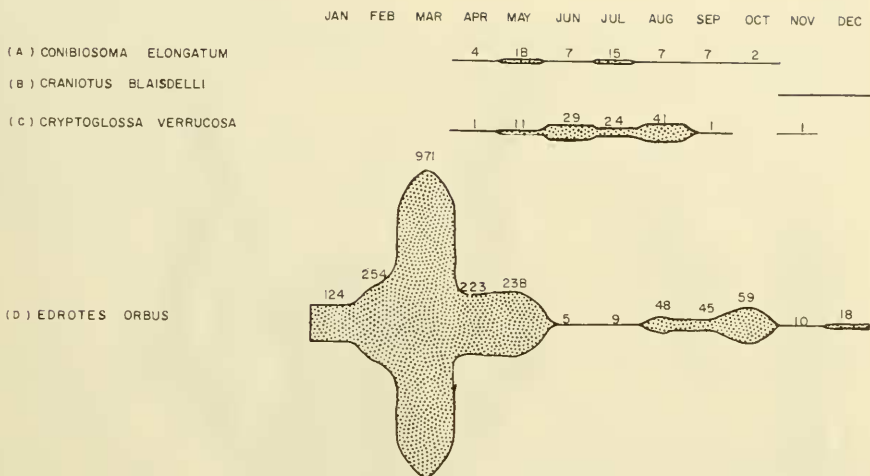


Figure XVI. Number of specimens seasonally collected in all the biotic communities.

ing slightly over half-way back on the pronotum. Pronotum densely punctate, margin feebly reflexed. Elytra oblong-oval, very finely punctate. Legs slender, anterior tibia set with small teeth or notches on the outer margin.

**Plant Community Associations.** A total of 71 specimens was collected. They were found in greatest numbers in the Larrea-Franseria community, with one-third the number in Salsola, and one-fourth in Lycium, Grayia-Lycium and Mixed. This species was not found in Atriplex-Kochia, Grayia-Lycium, Coleogyne, Pinyon-Juniper or Artemisia.

**Seasonal Activity.** This species was active from October to April. Activity was high during all these months except April. Greatest activity was during February and March. This species was active in the disturbed Grayia-Lycium, Salsola, and Mixed communities from October to March. Activity of this species started in both Larrea-Franseria and Lycium in November, but ceased in Lycium during February and continued in Larrea-Franseria until April.

2(1-2)-A-17 *Craniotus blaisdelli* Tanner  
 Figures V-E; XVI-B; XVII

**Reference.** Great Basin Nat., Vol. 23, Nos. 3-4, 1963, pp. 167-170.

**Morphological Characteristics.** Length 10 to 13 mm; width 5 to 6 mm; form robust, two times as long as wide. Color deep black, lustre dull to slightly shining.

Head small, projections at the sides of the head anterior to the eyes extend beyond one-third the width of the head; frons depressed between the projections and clypeal area; clypeus slightly emarginate; epistoma punctures discrete, small, irregular, each bearing a short black seta. Eyes transverse, not emarginate, larger dorsally. Antennae slender, third joint as long as the fourth and fifth combined, in length not extending to the pronotal base; the eleventh segment small, attached to apex of tenth.

Pronotum about one-sixth wider than long, sides without margins, disk convex, anterior angles acute, surface with irregularly placed papilliform structure, each bearing a decumbent brownish-colored seta. Base broadly truncate, scutellum elongate.

Elytra one-third longer than wide, base equal to that of the pronotum; humeri obsolete, sides broadly arcuate, disk moderately convex; arcuately precipitous at apex; surface devoid of striae; small punctures from which arise short stiff black setae; lustre dull to more or less shining, connate, the suture, however, is distinct. Epipleurae without a trace of a suture.

Legs long, especially the tibia of the metathoracic legs; coxae closed and widely separated. First and second abdominal sternites about equal in width, punctured and with black short erect setae.

Genitalia of the female, Figure V-A-B, of the elongate type, rather heavily sclerotized valvifer; coxite small, black, with obscure stylus; ninth

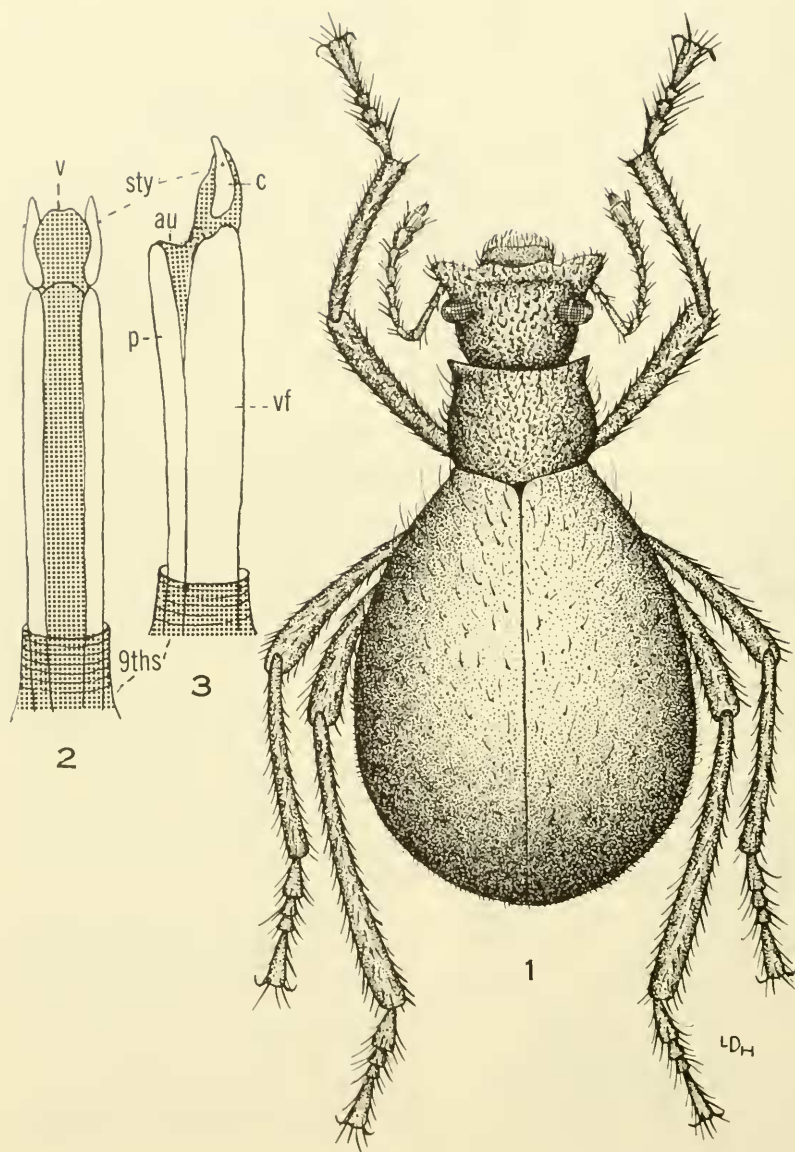


Figure XVII. *Craniotus blaisdelli* Tanner. (1) Dorsal view of female; (2) ventral view of genitalia; (3) lateral view of genitalia: v=vulva; sty=stylus; c=coxite; au=anus; p=pröctiger; vf=valvifer; 9ths=9th sternite.

segment membranous, acting as a sheath for the retracted genital organ. The female genitalia of *Pelecyporus semilaevis* is an elongate type similar in structure to *C. blaisdelli*.

**Plant Community Relationship.** A single specimen was collected in a Coleogyne community on November 28, 1960, one in a Larrea-Franseria community on November 9, 1961, and one in a Mixed community on December 8, 1961.

1(1-3)A-18 *Troglderus costatus nevadus*  
LaRivers

Figures IX-J; XX-G

**References.** LaRivers, Ann. of Ent. Soc. of Amer., XXXV, 1942, pp. 435-440. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 76.

**Morphological Characteristics.** Length 8 to 15 mm; elongate; opaque; reddish-brown to purple black; elytral costae acutely elevated. Head rough and tuberculate; antennae short and stout. Pronotum widest at the middle; evenly arcuate from apex to base with lateral margin serrate anteriorly and roughened posteriorly; median foveae faint to quite pronounced; densely punctate and coalescing. The elytral base narrower than opposed pronotum; sutural costa weaker than discal and humeral costa; sulci weakly and irregularly punctate. Legs rather stout; femora punctate; tibiae muricate; first joint of anterior tarsi with distinct process beneath.

**Plant Community Relationships.** A total of 188 specimens was collected. The greatest numbers occurred in Grayia-Lycium, with one-fourth of this number in Salsola and one-third in Mixed. In Lycium they were one-fifth as abundant, and in Coleogyne they were one-ninth as abundant. They were not found in Larrea-Franseria, Atriplex-Kochia and Pinyon-Juniper communities.

**Seasonal Activity.** This species was active from March through October, with the greatest numbers collected in August. From March through June there was a steady increase in collections. In July a slight decrease occurred. In August the number collected more than tripled. September collections returned to about the same rate as was observed in July. In October one specimen was found. In Salsola and Mixed their activity began in June and ended in September for Mixed, but continued into October in Salsola. In Lycium they were active during July, August and September; in Grayia-Lycium they were active in July and September. In Coleogyne they were active only in August.

**Comments.** This beetle was first described by LaRivers (1942) as a new species, *T. nevadus*. Tanner (1961) reduced it to a subspecies of LeConte's *T. costatus* (1879). Along with Dr. LaRiver's description were the observations that they were abundant in sand dunes. Many of our specimens, collected in Mixed community, were collected from sand dunes. In other communities they were most abundant where the soil was sandy.

1(1-3)A-19 *Embaphion elongatum* Horn  
Figures VIII-G; XIX-H

**References.** Horn, Trans. Amer. Phil. Soc., XII, New Series, 1870, pp. 321, 323. Blaisdell, Bull. 63, U. S. Nat. Mus., 1909, Mon., p. 454. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 76.

**Morphological Characteristics.** Length 12 to 16 mm; elongate; nearly three times longer than wide; surface dull; acute elytral margin reaching to apex. Head small, mentum trilobed, middle lobe broad, rounded in front, lateral lobes small; eyes distinctly emarginate; antennae long, reaching beyond base of pronotum. Pronotum with acute reflexed margin; apical angles narrowly rounded, attaining the eyes. Elytra elongate; margin acute, evenly reflexed and reaches the apex; surface sculptured with fine, irregularly and sparsely placed punctures; each puncture bears a minute decurved seta. Legs long and slender.

**Plant Community Relationship.** A total of 20 specimens was collected. They were found only in Pinyon-Juniper.

**Seasonal Activity.** They were active only in August and July with the greatest abundance being in August.

1(1-3)C-20 *Elcodes carbonaria immunitis*  
LeConte  
Figures VII-B; XVIII-C

**Reference.** LeConte, Proc. Acad. Nat. Sci. Philadelphia, 1858, p. 186.

**Morphological Characteristics.** Length 12 to 18 mm; oblong-ovate to ovate; more or less shining and smooth. Head finely punctate. Pronotum widest at, or just in front of, the middle; finely and sparsely punctate; apical and basal angles obtuse. Elytra finely and diffusely punctate; a serial arrangement usually evident.

**Plant Community Associations.** A total of 264 specimens was collected. The highest occur-



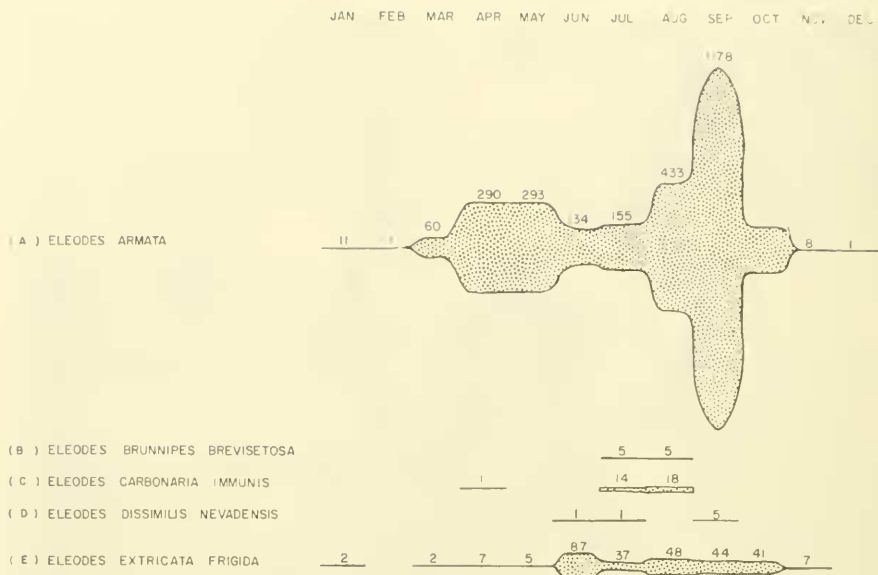


Figure XVIII. Number of specimens seasonally collected in all the biotic communities.

rence was in Pinyon-Juniper, with about one-fifth that number in Salsola and Grayia-Lycium. There were few specimens found in Artemisia, Kochia, Coleogyne and Lycium. *E. carbonaria* was active from March to November at lower elevations; on Rainier Mesa activity lasted only during July and August. Beetles were most abundant at the lower elevations in June whereas the higher altitude population peak was August. Only a few specimens were collected in March, April, January and May. Activity declined in July and August and then increased again during September and October. In the disturbed Grayia-Lycium and Salsola it was active from March through October.

1(1-3)C-21 *Eleodes obscura sulcipennis*  
Mannerheim

Figures VIII-D; XIX-E

**References.** Mannerheim, Bull. Moscow, XVI, 1843, II, p. 266; Mag. Zoo., XIII, 1843, p. 128. LeConte, Proc. Acad. Phil., 1858, p. 182; Entomological Report, 1857, p. 50. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 306. Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, pp. 190, 194; Pan-Pac. Ent., XI, 1925, pp. 77-80. Tanner, Great Basin Nat., XXI, 1961, pp. 55-78.

**Morphological Characteristics.** Length 24 to 33 mm; oblong, strongly sulcate and shining. Head half as long as pronotum; antennae long, fairly broad, not reaching base of pronotum. Pronotum broadest forward of the middle; lightly punctate, completely margined. Costa of the elytra distantly spaced, muricate punctures, the sulci with closely spaced muricate punctures. Legs long and heavy.

**Plant Community Relationships.** A total of 210 specimens was collected. They were found in greatest numbers in disturbed Grayia-Lycium, with about two-fifths the number in the Salsola and three-tenths as many in the Pinyon-Juniper communities. The populations in the Grayia-Lycium and Mixed communities were about one-tenth as large as in disturbed Grayia-Lycium. Only a few specimens were found in Larrea-Franseria, Lycium, Atriplex-Kochia, and Coleogyne.

**Seasonal Activity.** This species was active from March through October, and was most abundant during April and August. In May, June and March the populations were about half as large as in April and August. Very few were collected in October, September and July. In the disturbed Grayia-Lycium, Salsola, Grayia-

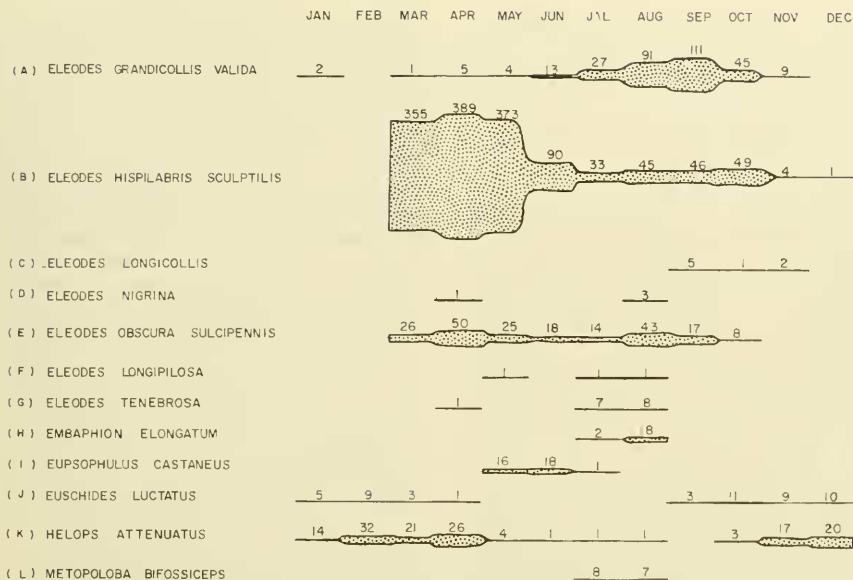


Figure XIX. Number of specimens seasonally collected in all the biotic communities.

Lycium and Mixed communities this species became active in March. Activity in disturbed Grayia-Lycium and Salsola continued until October. In Grayia-Lycium and Mixed the activity stopped in May, then resumed again in August, September and October. Activity in Larrea-Franseria, Lycium, and Atriplex-Kochia was from July through September. In the Coleogyne community beetles were active only in August.

**Comments.** Members of this species were frequently attracted to rolled oats used as bait for trapping rodents.

1(1-3)C-22 *Eleodes grandicollis valida* Boheman  
 Figures I; II; VII-E; XIX-A

**References.** Boheman, Kongliga Svenska Fregatten Duguenies Resa, etc., Coleoptera, Stockholm, 1858-1859, p. 90. Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, p. 208. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 72.

**Morphological Characteristics.** Length 25 to 30 mm; large and robust; oblong oval; black and shining. Head wider than long; antennae rather short and stout, reaching three-fourths of the way to the base of the pronotum. Pronotum widest at the middle; finely, evenly and sparsely

punctate. Elytra smooth and shining; oval and robust; punctures fine and arranged in series. Legs moderate in length and very stout.

**Plant Community Relationships.** A total of 308 specimens was collected. They were most abundant in the Lycium community. They were about two-fifths as abundant in the Grayia-Lycium and slightly less than one-third as abundant in the Larrea-Franseria. In the Salsola, Artemisia and Mixed communities they were one-tenth as abundant. A few specimens were found in Atriplex-Kochia and Coleogyne. None was present in the Pinyon-Juniper.

**Seasonal Activity.** This species occurred from March through November with the exception of two specimens collected in January. The greatest occurrence was in August and November. Specimens were collected from Grayia-Lycium in January, and then from March to November. Specimens were collected from the Lycium community in January and then from April to November. This species became active in June in Mixed, Salsola and Larrea-Franseria, and November in Mixed. Grayia-Lycium had activity from July through September, the Atriplex-Kochia in August and September, whereas in Coleogyne communities there was activity only in November.

1(1-3)C-23 *Eleodes hispilabris sculptilis*  
Blaisdell

Figures VIII-A, XIX-B

References. Blaisdell, Bull. 63, U.S. Nat. Mus., Mono., 1909, p. 220. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 72.

**Morphological Characteristics.** Length 18 to 37 mm; elongate ovate; somewhat shining; somewhat convex and sulcate; color black. Head wider than long; antennae long, reaching to base of pronotum; outer four segments compressed and dilated. Pronotum finely, sparsely, and evenly punctate; apical angles acute and everted; basal angles obtuse. Elytra sulcate; less than twice as long as wide; sulci have a series of evenly, closely placed, small separate punctures; costa convex, smooth, and shining, each with a single irregular series of distantly placed punctures. Legs slender, posterior femora reaching fifth segment of abdomen.

**Plant Community Relationships.** A total of 1,385 specimens was collected. The greatest numbers occurred in the Grayia-Lycium community, with three-eighths of this number in Salsola. In Coleogyne and Artemisia they were only one-fiftieth as abundant as in disturbed Grayia-Lycium. A few specimens were taken from Larrea-Franseria, Atriplex-Kochia and Mixed communities. None was found in the Pinon-Juniper or Lycium.

**Seasonal Activity.** This species was active from March to December, with the peak of abundance in March, April and May. The numbers collected dropped off rapidly in June and remained low from July to October. In November only four specimens were collected and in December only one. In disturbed Grayia-Lycium, Grayia-Lycium, Salsola, Coleogyne and Larrea-Franseria communities activity began in March. In Salsola activity was recorded until December whereas the disturbed Grayia-Lycium had activity until November and Grayia-Lycium only until May. Activity in Coleogyne stopped in April for four months then commenced again in September and October. In Larrea-Franseria there was no activity from the end of March until August, when slight activity was recorded. In Atriplex-Kochia community this species was found active during April and August, whereas Mixed communities had activity only in August and September.

1(1-3)C-24 *Eleodes longipilosa* Horn

Figures VIII-E; XIX-F

References. Horn, Trans. Amer. Ent. Soc., XVIII, 1891, p. 42. Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, pp. 212, 230. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 72.

**Morphological Characteristics.** Length 25 to 28 mm; elongate-oval; moderately shining; with a tail-like extension; surface sparsely covered

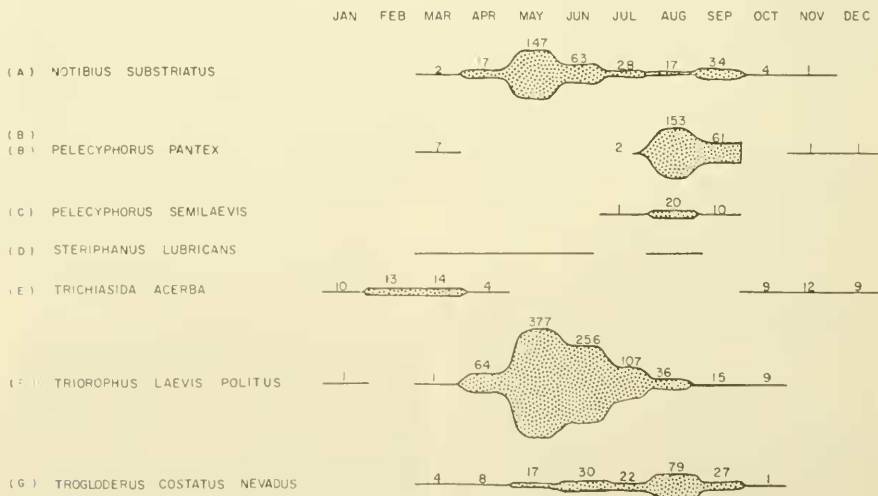


Figure XX. Number of specimens seasonally collected in all the biotic communities.

with long black hairs. Head irregularly punctate; hairs are long and flying; antennae moderately long and thick; slightly dilated on the last four segments; covered with rather long, stiff hairs. Pronotum widest slightly in advance of the middle; irregularly and sparsely punctate; long flowing hairs on the lateral edges. Elytra attenuated posteriorly in a tail-like extension; vaguely sulcate; punctures slightly muricate near suture, becoming strongly muricate laterally; both long flying hairs and short stout hairs are present. Legs moderately long and thick with long flying hairs.

**Plant Community Relationships.** A total of eight specimens was collected in the Grayia-Lycium, Coleogyne, Salsola, and Mixed communities.

**Seasonal Activity.** The three collections of this species were made in September, October and November. The September collection was in Mixed, Salsola and Coleogyne, October in Coleogyne, and November in Grayia-Lycium.

**Comments.** One of the eight specimens was collected in a can trap. Two others were taken by hand. Both were collected at dusk, one feeding on *Atriplex confertifolia* and the other emerging from a rodent burrow.

1(1-3)C-25 *Eleodes armata* LeConte

Figures VI-B; XVIII-A

**References.** LeConte, Ann. Lyc. N. York, V, 1851, p. 134; Arcan. Nat., 1859, p. 125; Proc. Acad. Phil., 1858, p. 181. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, pp. 303, 310. Blaisdell, Bul. 63, U. S. Nat. Mus., Mono., 1909, p. 259. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 72.

**Morphological Characteristics.** Length variable 24 to 33 mm; elongate; shining. Head moderately convex; more or less impressed laterally; frequently frons broadly and transversely impressed with the vertex strongly convex; antennae does not reach the base of the pronotum. Pronotum widest in advance of middle; sparsely and evenly punctulate; apical angles finely punctate; punctures in unimpressed series. Legs moderately long; hind femur reaching the fifth abdominal segment; femora with strong teeth.

**Plant Community Relationships.** A total of 2,878 specimens was collected. The greatest numbers occurred in the Larrea-Franseria community, with about seven-tenths of this number in Grayia-Lycium and four-sevenths in Lycium.

In Coleogyne they were about one-half as abundant, and one-third as abundant in Atriplex-Kochia and Mixed communities. They were only one-tenth as abundant in Salsola, and were not found in Pinyon-Juniper or Artemisia.

**Seasonal Activity.** These beetles were active all year long. They were far more abundant in September than at any other time. During November, December, January and February small numbers were collected. In March an increase occurred and a low peak was reached in April and May. In June and July the numbers collected decreased again. The amount increased abruptly in August and continued to increase to the high peak in September; in October collections decreased more abruptly. In the disturbed Grayia-Lycium this species was active in January. In February they were not collected, but were from March to November. In Salsola their activity started in February and continued through October. In Larrea-Franseria, Lycium and Mixed communities this species' activity started in March and ended in November, except in Lycium where activity continued into December. In Atriplex-Kochia, Grayia-Lycium and Coleogyne communities they were active in April and continued through October, except for Coleogyne in which they were active in November.

1(1-3)C-26 *Eleodes armata pumila* Blaisdell

**Reference.** Blaisdell, Trans. Am. Ento. Soc., LIX, 1933, pp. 191-210.

**Morphological Characteristics.** Length 18.0 to 20.0 mm; width 6.0 to 8.1 mm. Color black, punctuation fine and very sparse, except on head, where the punctures are large, rather closely set, and feebly muricate.

Head as long as wide. Epistoma truncate, frons anteriorly punctate. Labrum slightly convex, with an emargination at the apex. Antennae slender, in length attaining the pronotal base, third segment four times as long as the second. Pronotum wider than long, apex truncate and emarginate between the prominent apical angles; base slightly arcuate, angles obtuse; disk convex.

Elytra subcylindrical convex; base about equal to that of the pronotum; humeral angles obtuse; disk rounded from side to side; punctuation fine, close in striae series, interval space with irregular sparse punctures. Legs slender, moderate in length. Femoral teeth small and acute.

**Plant Community Relationships.** A total of thirty specimens was collected in the Grayia-Lycium and Lycium communities.

**Seasonal Activity.** These beetles were active from July until October. They were far more abundant in August and September. A few specimens were taken in November. They were associated with *armata*.

**Comments.** *Pumila* may be rather readily separated from *armata* by their smaller size, about one-half the size of *armata*; the shape of the pronotum; the very small punctures on the prothorax and elytra; and the smaller legs and femoral teeth, which are acute.

1(1-3)C-27 *Eleodes nigrina* LeConte

Figure VIII-C

**References.** LeConte, Proc. Acad. Phil., 1858, p. 186. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, pp. 303-313. Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, p. 393. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 75.

**Morphological Characteristics.** Length 27 to 29 mm; elongated oblong-ovate; over three times longer than wide. Head scarcely, coarsely, irregularly, and densely punctured on the front; base irregularly granulated. Pronotum widest in front of the middle; surface finely, densely, and irregularly punctate becoming granulate laterally. Elytra punctate, arranged without evident order on the dorsum, muricato-granulate laterally and on apex. Legs moderate in stoutness and length.

**Plant Community Relationship.** A total of four specimens was collected. They were present only in the Pinyon-Juniper community.

**Seasonal Activity.** Members of this species were active in April and again in August. They were most abundant in August.

1(1-3)C-28 *Eleodes dissimilis nevadensis*

Blaisdell

Figures VII-D; XVIII-D

**References.** Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, pp. 393-402. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 75.

**Morphological Characteristics.** Length 10 to 13 mm; cylindrical tapering at the posterior end; antennae, tibia, and tarsi with rusty reddish-brown setae and spinules; ventral surface pubescent. Head finely punctate, punctures denser at the periphery, each with a short reclining seta; antennae long and slender. Pronotum widest slightly in advance of the middle; evenly and not densely punctate. Elytra elongate, oval and smooth; slightly wider than pronotum;

stria-punctate; serial punctures small. Legs slender and somewhat long.

**Plant Community Relationships.** A total of 7 specimens was collected. They were about equally abundant in the Pinyon-Juniper and Larrea-Franseria communities and about one-fifteenth as abundant in disturbed Grayia-Lycium. They were not found in any of the other communities of the test site.

**Seasonal Activity.** These beetles were active in June, July and September. They were most abundant in September. They were active in June in disturbed Grayia-Lycium, July in the Pinyon-Juniper, and September in Larrea-Franseria.

1(1-3)C-29 *Eleodes longicollis* LeConte

Figure VIII-B

**References.** LeConte, Ann. Lyc. N. York, V, 1851, p. 134; Proc. Acad. Phil., 1858, p. 181. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, pp. 303-311. Blaisdell, Bull. 63, U. S. Nat. Mus., Mono., 1909, pp. 411, 425. Tanner, Great Basin Nat., XXI, No. 3, 1961, p. 75.

**Morphological Characteristics.** Length 24 to 32.5 mm; elongate to elongate-fusiform; black, smooth, and shining. Head finely and quite evenly punctate; eyes reniform; antennae moderately stout; reaches the base of pronotum; segments 9 to 11 ovate. Pronotum slightly wider than long; very finely margined; evenly arcuate; very finely and sparsely punctate. Elytra elongate; equal in width to the contiguous pronotum; finely, irregularly and evenly punctate; never asperate. Legs moderately long.

**Plant Community Relationships.** A total of 8 specimens was collected. The largest numbers occurred in the Coleogyne community, with three-fifths of the number in the Mixed and two-fifths in Salsola. They were not found in Larrea-Franseria, Lycium, Atriplex-Kochia, Pinyon-Juniper or Artemisia.

**Seasonal Activity.** They were active during September, October and November, with greatest abundance being in September. They were active only in September in the Salsola and Mixed and were active in September and October in Coleogyne. In disturbed Grayia-Lycium they were active only in November.

1(1-3)C-30 *Eleodes tenebrosa* Horn

Figure VIII-F

**References.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, pp. 304, 316. Blaisdell,



Bull. 63, U. S. Nat. Mus., Mono., 1909, pp. 311, 326. Tanner, Great Basin Nat., XXI, No. 3, p. 73.

**Morphological Characteristics.** Length 13 to 16.5 mm; oblong-oval; elytral sculpturing consisting of very small shining tubercles arising from a very opaque base. Head densely punctate laterally and on epistoma; base tuberculate; antennae moderate in length and slightly robust. Pronotum densely punctate in the center and granulate at the sides. Elytra slightly wider than pronotum, sides evenly and not strongly arcuate; and irregularly covered with small, rounded shining tubercles. Legs moderate, anterior tarsi dissimilar in the sexes, middle tarsi are similar.

**Plant Community Relationship.** A total of 16 specimens was collected. The only community in which they were found was the Pinyon-Juniper.

**Seasonal Activity.** Members of this species were active during the month of April, and then no further activity was recorded until July and August. They were equally abundant during the last two months. No further activity was found after August.

1(1-3)C-31 *Eleodes brunnipis brevisetosa*  
Blaisdell  
Figure VII-A

**References.** Blaisdell, Ent. News, XXIX, 1918, p. 162. Tanner, Great Basin Nat., Vol. XXI, No. 3, p. 75.

**Morphological Characteristics.** Length 12 to 13 mm; oblong-ovate; very densely and finely sculptured. Head two-thirds as wide as the pronotum, coarsely and densely punctate; antenna longer than the head and pronotum. Pronotum one-fourth wider than long; very deeply, coarsely, and confluent punctate; feebly arcuate to apex and broadly sinuate to base. Elytra nearly a third wider than the base of the pronotum; abruptly and obtusely rounded behind when viewed vertically; surface densely asperate, with the summits of the granules shining, each bearing a short seta. Legs moderate in length.

**Plant Community Relationship.** A total of 10 specimens was collected. They were found only in the Pinyon-Juniper community.

**Seasonal Activity.** This species was active only in July and August, and was equally abundant during these months.

**Comments.** When Blaisdell (1918) first described *E. brunnipis*, he called it a variety of

*Eleodes pimelioides* Mannerheim. Tanner (1961) raised *E. brunnipis* to a specific level and placed *brevisetosa* Blaisdell as a subspecies of that species.

1(1-3)C-32 *Eleodes extricata frigida* LaRivers  
Figures VII-C; XVIII-E

**Reference.** LaRivers, Journ. Ent. and Zool., Vol. 35, No. 4, 1943, pp. 54-58.

**Morphological Characteristics.** Length 13 to 21 mm; elongate; oblong-ovate to ovate; sparsely sculptured. Head deeply punctate anteriorly, becoming granulate posteriorly; antennae moderately long and stout, reaching to the base of the pronotum. Pronotum finely and unevenly punctate. Elytra moderately convex, with the sides broadly rounded; densely sculptured with small muricate granules, shiny at their summit. Legs moderately long and slender, anterior femora with acute spines.

**Plant Community Relationship.** A total of 30 specimens was collected. This species was found only in the Pinyon-Juniper community.

**Seasonal Activity.** A single specimen was taken in April. No others were found until July and August when the population appeared to be equal during these two months. There was no activity observed after August.

1(1-4)A-33 *Sphaeriontis dilatata* (LeConte)

**Reference.** Casey, Proc. Wash. Acad. Sci., X, 1908, pp. 56, 59.

**Morphological Characteristics.** Length 10 to 11 mm; elongate-oval gradually pointed behind; deep black in color. Head small; front greatly dilated and deeply emarginate at the apex; (antennae missing on all the specimens collected). Pronotum very sparsely and finely punctate; base bisinuate; basal angles acute and reticulate. Elytra slightly longer than wide; very feebly subcostulate with weak muricate punctures in sulca. Legs short and stout.

**Plant Community Relationship.** A total of four specimens was collected. They were found only in Lycium.

**Seasonal Activity.** Members of this species were found during February, April and June. They were most abundant in June.

**Comments.** This genus was established by LeConte (1866). Casey (1908) named most of the present species. After comparing our specimens with a previously identified *D. knausi*

Casey the present designation was given. This genus is in need of revision.

1(1-4)B-31 *Eusattus dubius* LeConte

Figure IX-B

References. LeConte, Ann. Lyc. N. H. N. Y., V, 1851, pp. 125, 216. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 294; Trans. Amer. Ent. Soc., X, 1882, p. 305; Proc. Cal. Acad. Sci. (2), IV, 1894, p. 423. Casey, Proc. Wash. Acad. Sci., X, 1908, pp. 56, 66. Blaisdell, Proc. Cal. Acad. Sci., XXIV, 1943, p. 192.

**Morphological Characteristics.** Length 6 to 10 mm; glabrous with a few small hairs laterally. Head sparsely punctate, densely so near the transverse suture; impunctate centrally; front widely dilated; antennae slender; last four segments dilated; the joints loose; apical segment is subcylindrical. Pronotum very minutely punctate; the sides narrowly explanate; angles both apically and basally slightly acute; scutellum wholly obsolete. Elytra as wide as pronotum or only slightly wider; surface faintly wrinkled; punctures fine but distinct; apex obtuse. Prosternum has only a few short hairs; process obtusely rounded. Legs short and stout; anterior tibia tapering into a moderate-sized apical process.

**Plant Community Relationships.** A total of 43 specimens was collected. The greatest number occurred in the disturbed Grayia-Lycium and Larrea-Franseria and a little over one-tenth in Mixed. These were the only communities in which they were found.

**Seasonal Activity.** The species was active from December through June and small numbers were collected in October. The greatest numbers were collected in March. Only a few were collected from December through February. After the peak in March, the numbers collected dropped off during April and May and then increased again in June. From Larrea-Franseria specimens were collected during October, January, February, April and June. Activity in disturbed Grayia-Lycium was more intense and for a shorter period. Here there was activity from March through June. From the Mixed community single specimens were taken in March, October and December.

1(1-4)B-35 *Eusattus agnatus* Casey

Reference. Casey, Proc. Wash. Acad. Sci., X, 1908, p. 76.

**Morphological Characteristics.** Length 9 to 12 mm; broadly rounded; very convex; rather

shining; deep black. Head finely wrinkled both above and below the transverse suture; finely granulate posteriorly; last segment of antennae obtriangular. Pronotum slightly explanate, punctures become less distinct dorsally; scutellum completely obsolete. Elytra as wide as the prothorax, parallel, sides straight, surface feebly rugose with sparser muricate punctures; prosternum sparsely punctate, under-surface quite hairy. Legs stout but moderately long; the anterior tibia extended into a long, blunt apical process.

**Plant Community Relationships.** A total of 206 specimens was collected. They were most abundant in Grayia-Lycium. They were slightly over two-fifths as abundant in Salsola, whereas a few specimens were taken from Mixed and Coleogyne communities. None was found in Artemisia.

**Seasonal Activity.** This species was active from March through October, with greatest abundance in August. Only a few specimens were taken in March, April, May, June and October. Activity increased abruptly during July and diminished just as abruptly during September. Activity of this species in disturbed Grayia-Lycium began in March and continued through October. In Salsola it did not become active until July and continued through October. It was active only in July and September in Mixed.

1(1-4)C-36 *Coniontis nevadensis carsonica*

Casey

Reference. Casey, Proc. Wash. Acad. Sci., X, 1908, p. 85.

**Morphological Characteristics.** Length 11 to 13 mm; elongate; convex; very dark reddish-brown to black. Head finely but strongly punctate; front very slightly dilated; eyes emarginate. Pronotum almost one-half as wide as long; sides broadly areolate; finely punctate, with extremely fine, short, light hair in each; slightly alutaceous along suture. Legs moderately short and stocky; tibiae and tarsi with heavy spines; femora punctate.

**Plant Community Relationships.** A total of 31 specimens was collected. The greatest numbers occurred in the disturbed Grayia-Lycium, with two-thirds of this number in Grayia-Lycium and Mixed communities. These were the only communities in which they were found.

**Seasonal Activity.** Members of this species occurred from March through September. They were most abundant during July, August and September. They were slightly more abundant

during March and April than they were in May and June. In disturbed Grayia-Lycium they were active from March through August. In Grayia-Lycium their activity was noted only in April, July and August, whereas in Mixed they were active from May through August.

1(1-4)D-37 *Coniontellus argutus* Casey

Figures V-C; XV-H

Reference. Casey, Proc. Wash. Acad. Sci., X, 1908, p. 145.

**Morphological Characteristics.** The single specimen studied was 7.5 mm in length. Oblong; rather elongate; glabrous, or appearing to be so; reddish brown to black; head very small; equal in length and width; front broadly dilated; eyes divided; antennae short and rather stout. Pronotum broadly arcuate in front; the apex narrower than the base; surface finely punctate. Elytra finely punctate, but very distinct; appearing to be slightly alutaceous. Legs short; very stout with heavy spines.

**Plant Community Relationship.** A total of 2 specimens was collected. They were collected in the Mixed community in August.

**Seasonal Activity.** The only collection made of this species was in August.

1(1-5)A-38 *Blapstinus vandykei* Blaisdell

Reference. Blaisdell, Trans. Am. Ent. Soc., LXVIII, 1942, p. 136.

**Morphological Characteristics.** Length 5 to 6 mm; oblong; moderately convex; black; pubescent. Head widest at the middle; densely and coarsely punctate; stiff black hairs; eyes divided, the upper portion large and round; antennae robust and short; clothed with stiff black hairs. Pronotum twice as wide as long; deeply and coarsely punctate; black hairs arising in each puncture; bisinuate basally. Elytra elongate; sides parallel; broadly rounded posteriorly; broad striae at narrow intervals; stiff, black, decurved pubescence arising from the striae. Legs fairly stout with short spines on tibia; fourth segment of anterior tarsi very short and smaller than third; the fifth segment is long.

**Plant Community Relationships.** A total of 35 specimens was collected. They were most abundant in Grayia-Lycium. A few specimens were found in Mixed. They were not found in any of the other communities.

**Seasonal Activity.** This species was active from March to October. There were two peaks of activity—one in March, the other in July. In the other months only a few specimens were collected. In disturbed Grayia-Lycium their activity started in March and continued until June; then in July activity started again and lasted into September. In Grayia-Lycium their activity started in May and lasted into October. In the Mixed community they were active during June and July.

1(1-5)A-39 *Blapstinus pubescens* LeConte

Reference. LeConte, Ann. Lyc. N. H. N. Y., V, 1851, p. 147.

**Morphological Characteristics.** Length of four specimens studied, 7 to 7.3 mm; elongate; deep reddish brown; short yellowish pubescence. Head deeply and coarsely punctate with slight coalescing; yellowing hairs present around eyes and over vertex; upper portion of eyes large and round; antennae fairly short and gradually thickened toward tip. Pronotum broadly emarginate anteriorly and deeply bisinuate posteriorly; densely and coarsely punctate; yellowish hairs laterally and basally; margins slightly flattened. Elytra elongate; broad costa covered with yellowish scale-like hairs; sulci finely punctate in series. Legs fairly short and stout.

**Plant Community Relationship.** Only four specimens were collected. They were found near Cane Springs in a Mixed community.

**Seasonal Activity.** The specimens were collected in June.

**Comments.** Specimens of this species were compared with specimens of the Horn collection in the Academy of Natural Sciences of Philadelphia and the U. S. National Museum by the senior author.

1(1-5)B-40 *Notibius substriatus* Casey

Figures IX-F; XX-A

References. Casey, Ann. N. Y. Acad., V, 1890, p. 479; Ann. N. Y. Acad., VIII, 1895, p. 622.

**Morphological Characteristics.** Length 4.5 to 5 mm; oblong; somewhat robust; fairly shiny; black with reddish legs and antennae. Head widest at the middle; bilobed at apex; somewhat coarsely and densely punctate, appearing granular; eyes divided, upper lobe minute; antennae robust, much shorter than head and pronotum. Pronotum one and one-half times wider than long; evenly arcuate at the sides and fringed with

stout hairs; surface coarsely, deeply and strongly punctate; laterally asperate. Elytra as wide as the pronotum; broadly rounded behind; both feebly impressed striae and intervals finely punctate. Legs very stout; anterior tibia dilated; middle and hind tibia with strong short spines.

**Plant Community Relationships.** A total of 316 specimens was collected. The greatest numbers occurred in the Grayia-Lycium community, with about two-thirds of this number in Salsola. A few specimens were found in Atriplex-Kochia, Mixed, Lycium and Larrea Franseria communities. They were not found in Coleogyne or Pinon-Juniper.

**Seasonal Activity.** Members of this species occurred from March through November. They were most abundant in May. There was a slight increase in the numbers collected during April, which resulted in the population boom in May. In June the numbers declined. They steadily decreased in July and August and then increased slightly in September. Only a few specimens were collected in October and November. Activity of this species started in March in disturbed Grayia-Lycium, Grayia-Lycium, and Mixed communities. It continued into November in disturbed Grayia-Lycium, died out in October in Grayia-Lycium, whereas in Mixed they had further activity only in May, June, July and September. In Salsola they were active in July and August, whereas in Larrea-Franseria and Atriplex-Kochia they were active only in July.

1(1-5)C-41 *Conibiosoma elongatum* (Horn)

Figures V-D; XVI-A

**References.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 351. Casey, Ann. N. Y. Acad., V, 1890, p. 476.

**Morphological Characteristics.** Length constant around 4 mm; elongate parallel; convex; shining; head and pronotum reddish-brown, elytra black. Head wider than long; finely, rather sparsely punctate; eyes divided; superior portion small and linear; antennae very robust; compact; shorter than head and pronotum; last three segments moderately dilated. Pronotum wider than head; finely, sparsely punctate towards the middle, denser and more coarse laterally. Elytra equal in width to the pronotum; sides nearly straight; even rows of fine punctures; the striae very feebly impressed; the intervals evenly punctate with each bearing a stiff seta. Legs moderate, tibiae not dilated.

**Plant Community Relationships.** A total of 60 specimens was collected. The greatest num-

bers occurred in Lycium, with one-half this number in Larrea-Franseria and about one-third in Grayia-Lycium. In Coleogyne this species was one-fifth as abundant as in Lycium. They were one-fifth as abundant in Atriplex-Kochia and one-sixth as abundant in Mixed, whereas there were only a few specimens collected in Salsola. They were not found in Pinon-Juniper or Artemisia.

**Seasonal Activity.** Beetles of this species were active from April through October. They were most abundant in May and July. In June, August and September slightly more than one-half as many specimens were collected as in May and July. Only a few specimens were taken in October. They became active in April in Lycium, disturbed Grayia-Lycium, Coleogyne and Mixed communities. They remained active until September in Lycium; August in disturbed Grayia-Lycium; July and August in Coleogyne; and May, July and September in Mixed. They were active in Larrea-Franseria during May, July and September, whereas in Grayia-Lycium they were active from May through July and in Atriplex-Kochia community in June and July. The collection in Salsola was made in October.

1(1-6)A-42 *Anemia californica* Horn

Figure XV-C

**Reference.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 378.

**Morphological Characteristics.** Length 3.5 to 4 mm; short; oval; robust; deep reddish-brown; winged. Head broad; densely and rather coarsely punctate; apex deeply emarginate; sides broadly dilated; eyes deeply emarginate; superior portion small; antennae short; robust; thicker at tip; last segment longer than tenth and rounded at tip. Pronotum nearly three times as broad as long; convex; densely and coarsely punctate; fringed with long yellowish hairs. Elytra broadly oval, scarcely longer than wide; sides fringed with long yellowish hairs; surface deeply and coarsely punctate. Legs short; robust; tibiae all dilated, covered with long yellowish hairs.

**Plant Community Relationship.** A total of 5 specimens was collected. They were found in the Lycium community.

**Seasonal Activity.** This species was collected in May and June.

**Comments.** Beetles of this species are nocturnal fliers. They were collected by their attraction to ultra-violet light. Not enough collections were made with the ultra-violet light to



determine this species' seasonal range of activity or community restrictions. Their body form resembles the Scarabaeidae.

1(1-7)A-43 *Coelocnemis punctata* LeConte

**References.** LeConte, Proc. Acad. Nat. Sci., VII, 1854, p. 225. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 337. Casey, Memoirs on the Coleoptera, XI, 1924, p. 319.

**Morphological Characteristics.** Length of specimen 20 mm; elongate; convex; dull black; moderately shining; resembles *Eleodes*. Head longer than wide; deeply, finely, and rather thickly pubescent; eyes large and reniform; antennae short and stout; first segment long and broad; the second segment very short; last five segments slightly compressed. Pronotum wider at apex than base; almost as broad as long; surface finely punctate. Elytra finely punctate and finely wrinkled; posterior rather suddenly sloping. Legs fairly long; tibiae and tarsi with fine silken pubescence underneath.

**Plant Community Relationship.** The single specimen collected was in Pinyon-Juniper. It was collected by hand from under rocks.

**Seasonal Activity.** This specimen was collected on July 26.

**Comments.** This genus needs to be completely revised.

1(1-7)B-44 *Alaephus nevadensis* Tanner,  
New Species

Figures IV-A; XV-A; XXI

Form elongate, rufotestaceous, median and lateral portions of the prothorax and elytra slightly paler; head and prothorax densely subrugose-punctate, dull in contrast to the rest of the body; elytra with prominent closely set punctures with inconspicuous short pale setae.

Head small, widest at the eyes, which is one-half as wide as the prothorax; maxillary palpi prominent, third segment hatchet-shaped. Eyes small, not noticeably projecting beyond the sides of the front; width between the eyes above, five times the length of the second joint of the antennae, beneath separated by four and three-tenths the length of the second antennal segment; antennae slender, less than half the length of the body; third joint only a little longer than the fourth segment; tenth segment slightly longer than the eleventh.

Prothorax two-thirds wider than long; apex four-fifths as wide as base, sides evenly rounded,

not sinuate before the hind angles, which are obtuse; disk evenly convex.

Elytra four times as long and twice as wide as the prothorax; humeral angle obtuse, sides parallel and arcuate beyond the middle; punctures under high magnification muricate with pale short hairs, noticeable near the declivity and margin. Scutellum prominent, wedge-shaped. Prothorax beneath rugulose punctate. Metasternum and abdomen finely, sparsely punctate; each puncture bearing a pale decumbent seta. Basal joint of the hind tarsus only a fraction longer than the distal fourth joint.

Length 6.6 mm; width 3 mm.

**Type locality:** Mercury, Nye County, Nevada. Collected by members of Brigham Young University, AEC Project, 1961-62. Type and four paratypes in entomological collection at Brigham Young University.

**Remarks:** *Nevadensis* belongs in Fall's couplet—eyes small, etc.—and is related to Horn's *pallidus*. It is a smaller species, darker, without the shining elytrae. Eyes are separated both

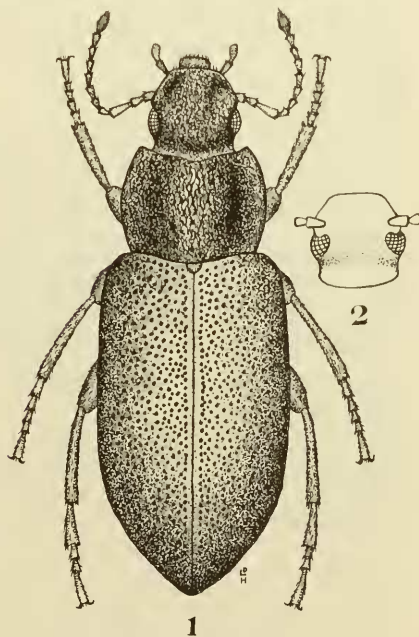


Figure XXI. *Alaephus nevadensis* Tanner. (1) Dorsal view of female; (2) dorsal view of head showing shape and distance of separation of the eyes.



above and beneath more than those in *pallidus*; antennae are shorter, the fourth joint is almost as long as the third one. Basal joint of hind tarsae shorter than in *pallidus*.

**Plant Community Relationship.** Four specimens of this species were collected on July 25, 1961, on *Elymus cinereus*, a large-type bunch grass, in a Mixed community and one on July 1, 1961, in a Mixed community.

**Comments.** The specimen collected on July 1 was in a Mixed community near Cane Springs in the same can trap as *Blapstinus pubescens*.

1(1-7)C-45 *Eupsophulus castaneus* Horn

Figures IX-A, XIX-1

**Reference.** Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 347.

**Morphological Characteristics.** Length 9 to 14 mm; elongate; chestnut brown; moderately shining. Head elongate; front narrowing anteriorly and broadly emarginate; very sparsely punctate; eyes broad; antennae longer than the head and pronotum; last segment long and slender. Pronotum subquadrate; slightly broader than long; surface sparsely punctured. Elytra elongate-oval; broader at base than pronotum; humeri distinct; sparsely punctured. Legs slender; tarsi long with short spinous hairs.

**Plant Community Relationships.** A total of 35 specimens was collected. The greatest numbers occurred in a Mixed community, with under one-half this number in Lycium and one-third in Grayia-Lycium. In Larrea-Franseria they were one-sixth as abundant as in Lycium. They were not present in Atriplex-Kochia, Salsola, Coleogyne and Pinyon-Juniper communities. This species is a nocturnal flying form. Most of the collections in Lycium and Mixed were made by the beetle's being attracted to ultra-violet light.

**Seasonal Activity.** This species was active during May, June and July.

**Comments.** Due to the few specimen collection attempts made with ultra-violet light it is not possible to make an accurate determination of seasonal activity or relative abundance in the separate communities.

1(1-S) A-46 *Helops attenuatus* LeConte

Figures IX-D, XIX-K

**References.** LeConte, Ann. Lye. N. Y., V, 1851, p. 137. LeConte and Horn, Class. Col. N. Amer., 1853, p. 240. Horn, Trans. Amer. Phil. Soc., XIV, New Series, 1870, p. 397; Trans. Amer. Ent. Soc., VIII, 1880, p. 152. Seidlitz, Naturg. Ins. Deutschl., V, 1896, p. 696.

**Morphological Characteristics.** Length 5 to 10 mm; elongate; convex; varies from reddish-brown to black with some having a lighter head and pronotum than elytra. Head fairly long; front dilated; coarse, dense punctures; eyes transverse and large; antennae long with outer joints slightly compressed and pubescent. Pronotum longer than broad; finely, densely punctate. Elytra elongate-oval; almost subcylindrical; humeri rounded; striae of coarse punctures. Legs long and fairly stout; heavy pubescent pad on all but the last segment of the tarsi.

**Plant Community Relationships.** A total of 140 specimens was collected. They were most abundant in Grayia-Lycium and about four-sevenths as abundant in the Larrea-Franseria, Coleogyne, Salsola and Atriplex-Kochia. In Mixed they were two-sevenths as abundant as in disturbed Grayia-Lycium. They were not present in Lycium, Pinyon-Juniper, or Artemisia.

**Seasonal Activity.** This species was active during every month except September, with the greatest numbers being collected during February. Only a few specimens were collected in May, June, July, August and October. There was an abrupt increase in the numbers collected during November, and then they remained at about the same level through December, January, March and April. In disturbed Grayia-Lycium and Mixed, activity began in October. They remained active in disturbed Grayia-Lycium until June, whereas in Mixed they were active only until March. In Grayia-Lycium, Salsola and Larrea-Franseria they were active through March, and in Salsola into February. In Coleogyne they were active in February, March and April; whereas in Atriplex-Kochia they were active in February, April, May, August and October.

## DISCUSSION

In the desert areas of southwestern United States the darkling beetles constitute a conspicuous part of the ground-dwelling insects. They are primarily nocturnal and spend the day under rocks, debris, loose bark or in rodent burrows. Occasionally on cloudy days they may be seen lumbering along the desert floor. To the casual observer of such desert regions, it may seem surprising that 46 species of tenebrionids occur in the relatively small area comprising the Nevada Test Site. However, upon closer examination of the vegetation, it is apparent that a variety of habitats exists for which many species of beetles may be indigenous. Inasmuch as this is apparently one of the first studies of its kind dealing with tenebrionids of a specific area, investigations in other desert areas may demonstrate these beetles to be even more common than this study has indicated.

## ABUNDANCE OF SPECIES

At the Nevada Test Site the number of species of beetles found varied between plant communities. The Mixed and disturbed *Grayia-Lycium* communities supported the largest number of species, whereas the fewest were found in *Atriplex-Kochia* and *Pinyon-Juniper*. These relationships may be explained on the basis of the greater variety of plant species which occur there. Such a mixture likely makes available a large variety of food for the plant-feeding darkling beetles. There are also a variety of microhabitats available to the many species. Comparing this environment with that of the *Atriplex-Kochia* where relatively few species were present, it is evident that in the latter community there are few plant species other than the two predominant ones. The vegetation is very short and sparse, and the number of microhabitats is greatly reduced. These factors likely influence the number of species that may inhabit this community. The *Larrea-Franseria* and *Lycium* communities, which are typical of the Mohave Desert, supported almost as many numbers of species as the *Grayia-Lycium*, which is more typical of the Great Basin Desert. Other communities such as *Atriplex-Kochia* and *Coleogyne* supported fewer species than *Larrea-Franseria* and *Lycium*, even though they occupied the same geographic localities. *Pinyon-Juniper*, typically Great Basin, supported the least number of species of all communities. Very likely the higher altitude, lower temperatures, increased moisture and longer periods of snow cover were

limiting factors compared to many species found in the other communities. This would lead one to assume that similar communities of the Mohave Desert may support a greater number of species than the Great Basin communities.

In areas where nuclear detonations have disturbed the normal biotic conditions, a different species association occurs. The disturbed *Grayia-Lycium* had a greater number of species than *Grayia-Lycium* whereas *Salsola* had less. In these areas the *Salsola* is just beginning the process of revegetation, and the number of invader plants are few. Disturbed *Grayia-Lycium*, however, is an ectonal area between the more stable, undisturbed plants and those areas where the native plants were completely eliminated. This community, then, may share species that are indigenous to the other two.

## POPULATIONS

With reference to total populations of all tenebrionids, the disturbed *Grayia-Lycium* contained approximately one-third more individuals than *Larrea-Franseria*. *Lycium* and *Coleogyne* supported only one-fourth as many specimens as did disturbed *Grayia-Lycium*. The Mixed community, in which the largest number of species was found, supported only one-seventh the population of disturbed *Grayia-Lycium*. The number of specimens in *Atriplex-Kochia* was considerably less than in any other community.

With reference to all tenebrionids there were two seasonal population peaks. In May and September over 2,000 specimens were collected. Approximately 1,500 were taken in June, 1,000 in July, and 1,500 in August. From the peak in September there was a sharp decline in numbers collected until December, when fewer than 100 individuals were found.

In *Coleogyne*, *Grayia-Lycium* and Mixed communities the largest number of beetles collected was in September, with a lower peak in April and May (Figs. X and XII). The number collected in *Larrea-Franseria*, *Lycium* and *Atriplex-Kochia* increased gradually from a December low to a high in August and September (Fig. XI). Following this the number collected declined rapidly. High populations occurred in disturbed *Grayia-Lycium* and *Salsola* during March, April and May, when the numbers of specimens taken were over a thousand each month. Collections declined in the following months, with a small increase in August and September (Figs. X and XII).

## PLANT COMMUNITY RELATIONSHIPS

Certain species demonstrated apparent plant community association more than others. These associations were shown by Allred, *et al.* (1963a, pp. 42-43).

One species, *Eleodes obscura sulcipennis*, was present in every community at the test site, whereas others were variously distributed in their occurrence.

Six species, *E. extricata frigida*, *E. tenebrosa*, *E. brunnipes brevisetosa*, *E. nigrina*, *Embaphion elongatum*, and *Coelocnemis punctatus*, were present only in the Pinyon-Juniper. These apparently are restricted to areas of higher elevation, cooler climate, and more abundant precipitation. *Blapstinus candykei* and *Alaephus nevadensis* were found only in Mixed vegetation near Cane Springs, where an abundance of lush vegetation near the spring may account for their presence. *Coniontellus argutus* was found only in Mixed, an area where *Artemisia tridentata* was rather abundant. *Sphaeriontis dilatata* was collected only in Lycium, which is 976 meters above sea level, one of the lowest areas in elevation at the test site. *Anemia californica* also was taken only in Lycium by the use of ultraviolet light. It may be shown to be more widely distributed should this collecting technique be used to a greater extent in other areas.

It is interesting to note that with reference to those species that were found in only one or a few communities, the total number of individuals was relatively low. Numbers of individuals of species which were more widely distributed were considerably higher.

## SEASONAL ACTIVITY

During July and August there were more species active over the test site than at any other time of the year. Thirty-three species were found during July and 31 in August. Beginning in September there was a steady decline in the number of species active until February, when only nine were found. In March species activity increased, and 20 were found. In April the number increased to 27, dropped to 22 in May, then increased to 27 again in June.

The length of time that the different species of tenebrionids were active varied considerably. Many were active for a specific season; others persisted for two or three seasons, whereas some were active all year. Although some were more

active in winter, the majority were inactive during the colder months.

Three species, *Edrotes orbus*, *Araeoschizus sulpicollis* and *Eleodes armata*, were active every month of the year. *E. orbus* was most active during the winter and spring, whereas the other two demonstrated greatest activity in summer and autumn.

Three species, *Euschides luctatus*, *Trichiasida acerba* and *Helops attenuatus*, were active from the beginning of autumn through the spring. One species, *Eusattus dubius*, was active during the winter and spring.

In the spring considerable activity was manifested by many species. Some remained active only through summer (*Centrioptera muricata*, *Cryptoglossa verrucosa*, *Anepsius brunneus*, *Eleodes longipilosa*, *Sphaeriontis dilatata*, *Coniontis nevadensis*, *Blapstinus carsonica pubescens* and *Eupsophulus castaneus*), whereas others continued into autumn (*Metoponium convexicolle*, *Triorophus laevis politus*, *Eleodes carbonaria immunis*, *E. obscura*, *E. grandicollis valida*, *E. hispilabris sculptilis*, *Trogloclerus costatus nevadus*, *Eusattus agnatus*, *Notibius substriatus* and *Conibiosoma elongatum*).

Those active only during the summer were *Chilometopon abnorme*, *Metopoloba bifossiceps*, *Eleodes extricata frigida*, *E. tenebrosa*, *E. nigrina*, *E. brunnipes brevisetosa*, *Embaphion elongatum*, *Coniontellus argutus*, *Blapstinus pubescens*, *Anemia californica*, *Coelocnemis punctata* and *Alaephus nevadensis*. Others that demonstrated increased activity in the summer and continued into autumn were *Hylocrinus laborans*, *Pelecyporus pantex*, *P. semilaevis*, and *Eleodes dissimilis nevadensis*. One species, *E. longicollis valida*, was active only during the autumn.

## LIFE HISTORY AND FOOD HABITS

Tanner (1961) reported that some members of the genus *Eleodes* hibernated "... in the adult or partly grown larval stage." O'Kane (1924) states that some tenebrionids have one generation annually. As shown by this study there are two population peaks—May and September. These two peaks suggest that some species metamorphose from pupa to adult in the autumn and over-winter as adults. Others over-winter as larvae and emerge as adults in the spring. This may account for the two seasonal peaks in May and September and low numbers during July and the winter months.

## SUMMARY

The intent of this study conducted over a period of three years was to (1) provide descriptions of the species of tenebrionids found at the Nevada Test Site, (2) determine their relative abundance, (3) determine their seasonal activity, and (4) ascertain their plant community relationships.

A total of 14,650 beetles representing 46 kinds of tenebrionids was collected with sunken can traps, by hand, and ultra-violet light. Collections were made at regular intervals in the following plant communities: Larrea-Franseria, Lycium, Atriplex-Kochia, Grayia-Lycium (disturbed and undisturbed areas), Salsola, Coleogyne, Pinyon-Juniper, and Mixed.

The data obtained from this study indicate

that (1) more species were present in some plant communities than in others; (2) in nuclear disturbed areas a larger number of species was present than in undisturbed areas; (3) some species were more closely associated with some plant associations than with others; (4) those species that were not widely distributed ecologically were fewer in number of individuals, whereas those that were widespread occurred in larger numbers, relatively speaking; (5) the species demonstrated variation in seasonal activity in that some were active for short periods whereas others were active during the whole year; and (6) the two seasonal peaks in population are indicative that some species over-winter as adults whereas others over-winter as larvae.

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